Economic Geography

of

Asia

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by

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TO

MY WIFE

Preface

THE geography of a continent as large as Asia could not be treated completely within the page-limit of an average college text. Such study would involve a number of volumes. Thus the author has confined his material mainly to the economic geography of this extensive land mass. Moreover, the book is a frame or structure in which more detailed information on the economic geography of Asia may find a proper setting.

The *Economic Geography of Asia* is a contribution toward the understanding of the various countries of Asia, their economic-geographic regions, their major commodities, their industries and commerce. It has been the constant aim of the author properly to evaluate major occupations in the various parts of Asia, and to give a reasoned account of the economic adjustments to the environment rather than the traditional enumeration of facts. Any interpretation of the economic geography of the various parts of this major land mass must be based upon adequate knowledge of space relationships, climate, relief, and natural resources. In addition, political, racial, and social factors have a direct and significant bearing upon industrial and commercial activities.

Most of the written materials as well as graphs and maps used in this text have been worked out from basic sources, such as census reports, commercial reports, commercial yearbooks, and economic and geographic surveys, as well as from geological and meteorological records. A great quantity of general information on Asia has appeared from time to time in various of the geographical publications, such as the *Geographical Review*, *Economic Geography*, *The Journal of Geography*, *The Geographical Journal*, *The Bulletin of the Philadelphia Geographical Society*, and *The National Geographic Maga-*

zine. In addition, *Asia* and the *Far Eastern Review* contain a large body of valuable literature on this continent.

The author owes an incalculable debt to hundreds of other writers whose ideas have been of assistance in the preparation of the book. Most of the maps and graphs are original with the author and are based on recent sources of information. Yet in a number of cases the maps of other writers have been consulted and have aided the author in the final preparation of his illustrations. Hearty thanks are due to those whose names appear on such maps.

The author wishes to express his gratitude to all those who have aided directly as well as indirectly in making the writing of this book possible, and particularly to Dr. Nevin M. Fenneman, Chairman of the Department of Geology and Geography at the University of Cincinnati, for the necessary facilities for writing and a sympathetic attitude toward the work. Special acknowledgment is due Dr. Nels A. Bengtson, who read the entire manuscript critically and offered many valuable suggestions; and to my wife for moral support and untiring active assistance, and also for typing the entire manuscript.

DANIEL R. BERGSMARK

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Part I

THE CONTINENT AS A WHOLE

CHAPTER I

Distinguishing Characteristics of the Continent

Diversity and extremes.—Asia surpasses all continents in area, number of people, and acres of cultivated land. By reason of its vast extent—from the tropics to the Arctic—it contains diverse climatic and vegetative regions, which are matched by diversity in soils, relief, and occupations of man. The most abundant rainfall (at Cherrapunji, India), the lowest recorded temperature, the highest mountain, and the largest high plateau—all are found in Asia (Fig. 1). With climatic regions ranging from the tropical rain forest along the Equator to the bleak and barren areas of the tundra and the Arctic, Asia possesses a varied habitat for human development, as reflected in the diversity of man's economic activities, of language, of race, and of religion. In short, a journey through Asia unfolds to the traveler a variety of natural settings and an ever-changing panorama of cultural patterns. It is with these various environmental features and man's adjustments thereto that the student of Asia's geography is primarily concerned.

Distinctive race.—Just as Europe and North America are distinctive as the home of white man, so Asia is the home of yellow man; although various other races and sub-races (Nordic, Negrito, brown, Alpine, etc.) have developed here. Moreover, Asiatic peoples may be traced back to ancient beginnings. It was in the Pliocene deposits of northeastern Java that certain parts of Pithecanthropus erectus were unearthed,[1] and other indications of prehistoric human occupancy of Asia are disclosed in skeletal remains of Sinanthropus unearthed in north China. Still other remains of primitive man probably

[1] An extinct animal, which, when living, apparently resembled the human type more closely than any of the anthropoid apes. The parts found consist of an incomplete calvarium, two molar teeth, and a diseased femur. The femur showed by its shape that the animal walked erect.

will be found somewhere in the vast interior dry land and highland of central Asia. From this interior area peoples moved westward into Europe, eastward into the valleys of China, and southward into the Indo-Gangetic Plain of India. Students of anthropology believe that at various times there has been close

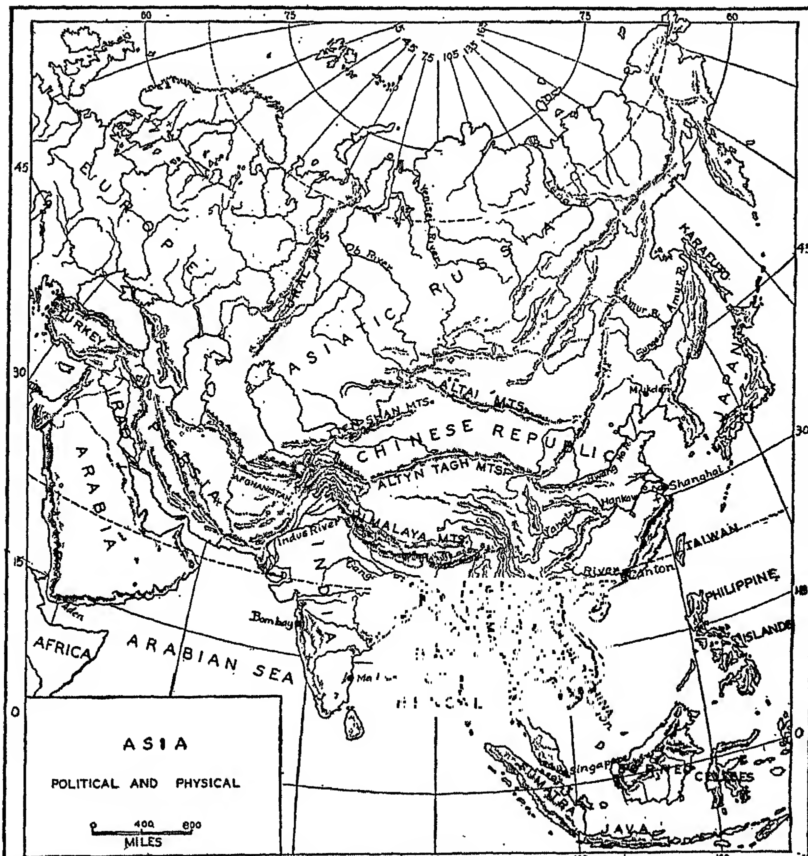

Fig. 1.—Political and physical map of Asia. (Base map according to J. Paul Goode, plotted according to Alber's Equal Area Projection.)

communication between eastern Asia and the New World. In fact, man reached America from Asia by way of the Bering Strait, prehistoric man having crossed this narrow strait at least once, and possibly many times.[2] From northwestern

[2] Buxton, L. H. Dudley: *The Peoples of Asia,* Kegan Paul, Trench, Trubner and Co., London, 1925, p. 33.

North America peoples spread fanwise into various parts of the New World. In short, Asia is distinctive from the standpoint of human development, not only by reason of her early civilizations, but also because of her peopling of other continents.

Early development of civilization and irrigation agriculture.—At present irrigation agriculture is widely practiced in Asia, especially in the central and southwestern divisions of the continent. This type of agriculture may be traced back to ancient beginnings; indeed, to a time when man was beginning his climb on the lower rungs of the ladder of civilization.

Records of man's early development indicate that his progress was considerably accelerated when he learned to control waters and to utilize them for the production of crops essential to his material well-being. As a hunter and pastoral nomad in central and southwestern Asia, he was markedly dependent upon the erratic precipitation of these regions. After learning the art of irrigation, he raised himself from his more or less precarious occupations to the more secure, sedentary pursuit of being a tiller of the soil. Moreover, in his new occupation, he developed rapidly under the stimulus of a more highly interactive life. Irrigation agriculture calls for coöperation on the part of the various individuals using an irrigated area, and the labor as well as the intensive cultivation necessitates a closer settlement than is possible in pastoral regions. The harvests were large because of the fertile unleached soils that developed in parent materials which were washed from adjacent highlands. In addition, the water supply could be so regulated that the crops received the proper amount of moisture. They, therefore, were neither over-watered nor allowed to get too dry. Again, where the temperatures were favorable, several crops could be obtained from the same land during a year's time; this avoided periods of enforced idleness which otherwise were necessary in the arid lands of the continent.

The growth of the brilliant empires in the delta region of the Tigris-Euphrates Rivers was based mainly upon the extensive and successful development of irrigation agriculture in

a region which was otherwise barren steppe. Here Babylon (1000 B.C.), Nineveh (700-800 B.C.), and Bagdad (A.D. 762) constituted the centers of political units whose rise to power depended directly upon agriculture by means of irrigation in areas of river mud which the mighty Tigris-Euphrates rolled down from the faraway mountains of Armenia.

Records of early development of irrigation are found also in the valleys of Anatolia, and in Palestine, Syria, Arabia (chiefly Yemen), Persia, Turkestan, and various other parts of arid and semi-arid southwestern and central Asia. In the latter area the irrigated districts were first located where mountain streams rolled down large supplies of silt, depositing them in the many alluvial fans upon which the cultivated areas associated with irrigation agriculture had their development.

From the irrigated districts of inner and southwestern Asia people spread into various other parts of the continent, carrying their irrigating skill with them and transplanting the agricultural practices with which they were familiar into these new lands. Moreover, migration was commonly a necessity by reason of the limited areas that these people were capable of utilizing for crops. They lacked the necessary tools with which to further develop irrigation agriculture or to cultivate the extensive semi-arid lands in central Asia. Upon reaching the valleys of China and India, these people found considerable room in which to transplant their irrigation agriculture and extend its practice. Thus, in the Wei Ho Valley of north China, the so-called "cradle of the Chinese civilization," are found evidences of a culture which had its origin in central Asia. Although modified through the centuries, this culture spread throughout various parts of China. Similarly, people from southwestern and central Asia settled in the fertile Indo-Gangetic Plain.

The Orient versus the Occident.—The civilizations of both the Orient—the most important part of Asia—and the Occident carry back to ancient beginnings. But great changes have taken place in the latter, especially in the development of a

complex industrial structure with its large factories and intricate network of production and distribution facilities; whereas the Orient has changed but little during the last few centuries. The people of the Orient are still predominantly rural, as indicated by the large percentage engaged in agricultural activities. Manufacturing of the factory type has made some progress in certain parts of the Orient, but cottage and workshop industries still account for the greater part of the manufactured goods used by Asia's millions. Yet the trends are toward the factory system, as indicated by the developments in the textile and metallurgical industries. The growth of the factory system in the Orient is definitely indicated by the developments of the cotton and silk textile industries in Japan, the jute bag and jute cloth industries of India, and the cotton textile industry of China.

Political change and some of its results.—Politically, significant changes are taking place in some parts of Asia. Nationalism is growing in the larger countries, especially in India and in China, where powerful forces are at work breaking down certain traditions which have acted as a drag upon modern industrial development. Japan's recent (1932) political entanglements in Manchukuo and Asiatic Russia's control by the newly-established U.S.S.R. are other political features that are of major consequence. Such political changes will in all probability have far-reaching effects, not only upon the industry and commerce, but also upon social customs, religion, and even language. For example, the Nationalists of India are attempting to abolish the caste system and introduce Hindustani as the mother tongue of India's 350,000,000 people. Superstitious religious beliefs gradually disappear as educational facilities are provided. Thus, in explaining man's adjustment in the various parts of Asia, it becomes necessary to consider not only the physical factors—climate, soils, relief, etc.—but also the interplay of political, economic, and social elements.

Asia as a producer and consumer.—Asia is becoming increasingly important in the commercial life of the world, and

to an ever-increasing extent the West is looking to the East for a variety of products—especially those of the field rather than the factory. The world demand for the products of the East has provided means for the more complete development of the natural resources of eastern countries, and it has contributed to their economic progress. Contact with the Western World also has brought about new tastes. But by reason of the simple life of the peasants who constitute the major part of the population of Asia, trade is confined very largely to the necessities of life. These teeming millions have a low purchasing power and therefore a low standard of living, so that this Eastern market is not so large as the population would seem to indicate.

In the production of various commodities, Asia occupies a high rank among the continents of the world. By reason of its great size this continent contains not only diverse geographical conditions, but an abundance and variety of raw materials. Its forests and mineral resources are important, yet they have been but little exploited. Vast stretches of agricultural land constitute the geographical base for agriculture, which is the dominant activity and the chief source of wealth of Asia's millions. It is characterized as being chiefly a maintenance or subsistence type of agriculture—another distinctive characteristic of the major economic activities of Asia. Yet cash crops are becoming more important, especially in the southern and eastern parts of the continent. Dates in Mesopotamia, rubber in Malaya, silk in Japan, soy beans in Manchukuo, rice in Indo-China—these phrases indicate some of the commodities of commerce for which Asia is distinctive and the chief areas in which these economic goods are produced.

Although large mineral resources are found in some parts of Asia, they are but little utilized. Basic minerals, such as iron ore and coal, occur in relatively large deposits in India China, and Asiatic Russia. But the coal production in India and in China is matched even by relatively small European producers, such as Belgium and Czechoslovakia. On the

other hand, Asia occupies a distinctive place among the major land masses of the world in the mining of tin, with 69 per cent of the world's total; antimony, 80 per cent; and tungsten, 80 per cent (Fig. 2). Not all parts of Asia, however, have been fully explored for their mineral resources; and many areas in which minerals have been found are handicapped by lack of capital, poor transportation facilities, political disturbances, low purchasing power, and various other factors that check development.

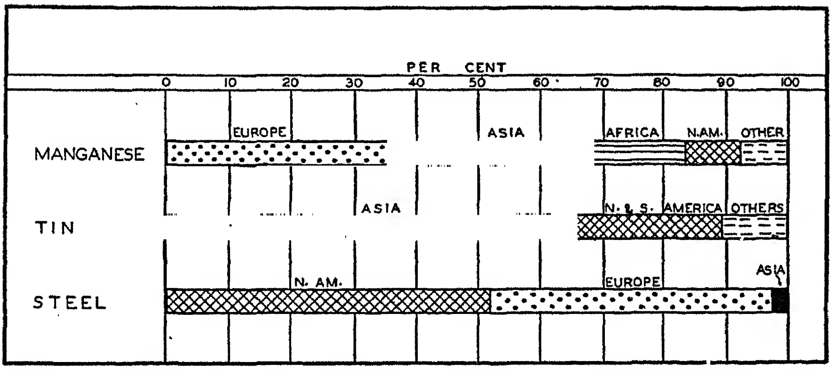

Fig. 2.—Asia's relative rank among the continents as a producer of tin, manganese, and steel.

Although industry has long been important in Asia, manufacturing of the factory type has not yet become widespread. The continent, therefore, imports large quantities of factory products from the industrialized areas of the world, mainly from the two hubs of industry and commerce; namely, eastern United States and western Europe. Moreover, manufactured goods are entering Asiatic countries in increasing quantities—a trade condition which has been favored during recent years by increasing specialization in agricultural production. Thus, the large rubber and tin exports of British Malaya make possible large imports per capita of a variety of manufactured goods. Similarly, specialization in the production of cane sugar in Java, tea in Ceylon, rice in Indo-China, silk in Japan, and sugar cane in the Philippines has

enabled these areas to import to an ever-increasing extent the factory products of foreign lands.

Possibilities of further commercial expansion.—Large parts of the vast continental mass of Asia are as yet lacking in favorable means of communication. With the development of transportation in such areas the people will not only increase their wants, but also the power to satisfy them. Such developments suggest the tremendous possibilities of commercial expansion in these lands of teeming millions. Japan illustrates nicely what might be accomplished. The location of the Japanese islands favors contacts with other lands. Here internal means of communication have been speedily developed. The effect upon the foreign trade has been noteworthy. Thus, the Sunrise Kingdom had a total import trade

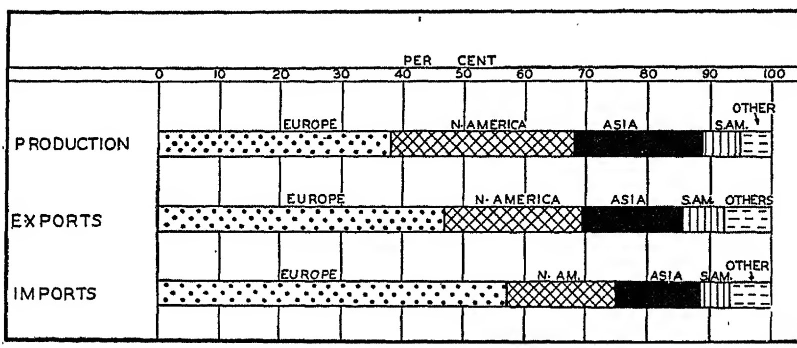

Fig. 3.—Shares of the various continents in the world totals of production, exports, and imports. The third rank of Asia is noteworthy.

valued at only $17,000,000 in 1870, whereas the Japanese imported commodities valued at more than $853,000,000 annually during the period 1928-1931. This trade, moreover, is of great importance to the United States, which has become Japan's best customer. On the other hand, in China transportation is poorly developed, and various regions are isolated by reason of the lack of communication. In fact, it took more than a month for the news of the Kansu earthquake (1920) to reach the outside world, whereas the destruction resulting from the Yokohama-Tokyo earthquake

(1923) of Japan was known in the United States within a few hours. More detailed material on the trade and transportation of Asia is given in various other parts of this text.

In surveying the shares of the continents of the world in production, imports, and exports during recent years, it is found that Asia may be regarded third in rank among the major land masses—Europe and North America occupying first and second place respectively, with South America fourth (Fig. 3). Thus, in spite of the fact that Asia contains more than half of the world's population, she ranks third in production and consumption of economic goods by reason of (1) her low per capita productive capacity, and (2) her low purchasing power.

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CHAPTER II

Space Relationships and Anthropo-Geographical Significance

Situation.—Asia, the largest of the continents, is located mainly in temperate latitudes and reflects a continental heating in summer and cooling in winter which is so intensive that it has no equal among the major land masses of the world. Like North America, Asia extends from intertropical latitudes to the cold Arctic regions. The major part of the continent is a compact mass of land with a somewhat quadrangular shape. The extremities, however, are broken and large peninsulas radiate outward, especially in the southern part; whereas many of the off-shore waters are festooned with islands.

The three vast peninsulas—Arabia, India, and Indo-China—which Asia projects southward into tropical seas—have been compared with the Iberian, Italian, and Balkan Peninsulas of Europe. Although the contrasts are more striking than the similarities, it is interesting to note that the Iberian and the Arabian Peninsulas occupy similar positions (southwestern) on their respective continents; and both contain extensive highlands in which the rainfall is small and erratic. The Italian Peninsula may be compared with the peninsula of India in its general position, and it is noteworthy that both areas are flanked on the north by high mountains south of which important plains—the Po and the Ganges—have developed. Again, the Balkan Peninsula, by reason of its physical diversity and southeastern location in Europe, may be compared with Indo-China, the southeastern projection of Asia. The huge southern extremities of Asia, however, differ markedly from the European projections in their indi-

viduality and their large-scale articulations, as contrasted with the small articulations facilitated in an island-enriched Mediterranean Sea. In fact, Asia's large southern projections are major geographical entities which, from the standpoint of size and distinctive characteristics, rank next only to the continents. This individualization is clearly shown in India, with more productive land than Australia and a population that is approximately double that of North America. This peninsula of Asia reflects aloofness and self-sufficiency to such an extent that it becomes to its government administrators "the Continent of India."[1]

The island fringe.—The political boundaries of Asia stretch beyond the continental land mass itself, especially in the east and southeast. To the east of the continent, the Japanese archipelago constitutes the most important off-shore unit; whereas to the south, the Philippines and the East Indies are peripheral units of major significance. In general, Asiatic islands have borrowed freely from those parts of the continent which are located adjacent to them—as reflected in similarities in social status, religious beliefs, and economic development. Thus, Japan shows the influence of nearness to China and Korea, just as the East Indies reflect effects of Hindu, Malayan, and Chinese culture.

In the vast island-strewn region of the East Indies the biological features suggest land contacts with Asia's mainland during prehistoric time. Scientific investigators early recognized that the islands located nearest the continent possess a greater number of species of plants and animals in common with those found on the mainland, and that the greater the distance from the continent the more distinctive are the indigenous biological types of such island areas. Thus, in the Philippine Islands the flora and fauna have reached a remarkable degree of specialization, suggesting that this archipelago was separated from the continent a long time ago. Sumatra and Borneo, on the other hand, disclose in their

[1] Semple, Ellen Churchill: *Influences of Geographic Environment,* Henry Holt and Co., New York, 1911, p. 398.

biological features relatively recent land-contact with Asia's mainland—more recent, indeed, even than Java and Madura.

Beyond the bleak northern shores of the continent are various Arctic islands, some of which are sparsely populated by a few nomad Samoyede, Yakut, Yukaghir, and Chukchi tribes; others contain no permanent settlements, but are visited in winter by hunters who are accustomed to the rigorous cold of northern Siberia.

Europe as a peninsula of Asia.—Combined with Europe, her neighbor on the west, Asia forms the major land mass of Eurasia. But geographically, Europe may be regarded as merely a large western peninsular prolongation of Asia, in spite of the fact that politically the latter may almost be regarded as a dependency of the former. With respect to spacial differentiation of natural and cultural features, it is noteworthy that various natural environment regions of Europe continue eastward into Asia. Thus, tundra, northern coniferous forest, steppe lands, and mediterranean regions are found on both continents.[2] The Ural Mountains, separating Asia and Europe, do not constitute a marked barrier to the migration of people. Moreover, from the southern extremity of these mountains to the Caspian Sea, level semi-arid and arid plains give easy access from one continent to the other. This lowland gate, indeed, has developed historical significance mainly as a passageway for Asiatic hordes as they advanced upon the peoples of Europe.

In its broader aspects, this relationship of Asia to Europe is further emphasized by the general similarity of many of their racial elements. According to L. Dudley Buxton, the ethnological boundaries follow the parallels, and therefore only serve to divide peoples within the combined land mass. Hence, it is necessary for the most part to emphasize the ethnological unity of the continent of Eurasia.[3]

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[2] Case, E. C., and Bergsmark, D. R.: *College Geography,* John Wiley and Sons, New York, 1932, Fig. 63.

[3] Buxton, L. H. Dudley: *The Peoples of Asia,* Kegan Paul, Trench, Trubner and Co., London, 1925, p. 32.

The cultural influence of Asia in the past spread outward to adjacent lands, and the continent gave more than it received from neighboring areas. Thus, terrace cultivation, so well developed in Spain, may be traced back to its place of origin in southwestern Asia. Yemen, located in the mountainous lands of Arabia, contains ruins of large irrigation dams, indicating vastly important agricultural developments in the past. From Yemen as a center, this system spread westward into Spain and northern Africa and eastward into Baluchistan and even into the Indus Valley.

Proximity to Africa and North America.—The narrow strip of land through which the Suez Canal extends has long served as a bridge between southwestern Asia and northern Africa. Some of the races inhabiting Africa today may be traced back to peoples who formerly occupied southwestern Asia. From the standpoint of history, this cultural influence has been quite one-sided, the thrust being outward from Asia with essentially no reciprocal action.[4]

Separated from North America only by the narrow gap of the Bering Sea, Asia is essentially linked up with the New World, a link which further facilitates contact by reason of the presence of ice in these northern areas. Here is another point of migration of Asiatics, and records indicate that man certainly arrived in America by means of this route. In fact, man early crossed the Bering Strait at least once, and probably many times.[5] From this narrow zone of contact the migrating peoples spread fanwise into various parts of the New World.

Size and variety of resources.—As the largest of the continents, Asia covers 17,200,000 square miles of land, and therefore exceeds in size the combined area of North and South America by more than one million square miles. Along the sixtieth parallel it stretches approximately one-third the distance around the globe, and extends latitudinally through a distance of more than five thousand miles. Since an ex-

[4] *Ibid.*, p. 34.
[5] *Ibid.*, p. 33.

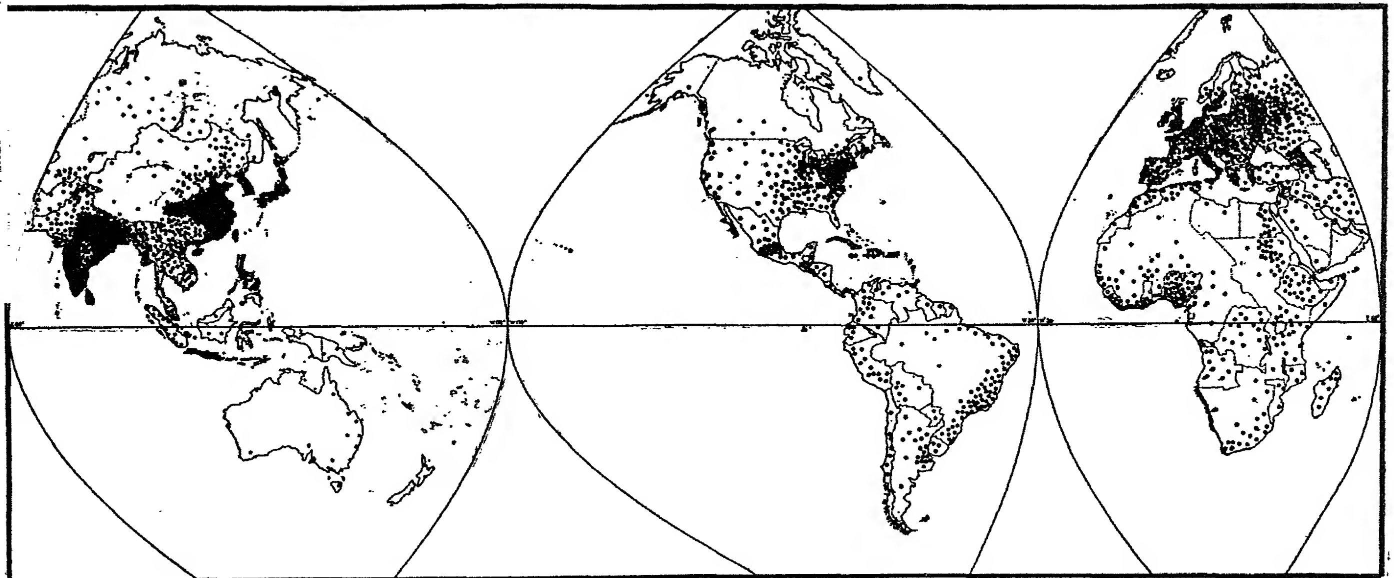

Fig. 4.—Distribution of the world's population. Each dot represents 500,000 people. (U. S. Department of Commerce, plotted on Interrupted Sinusoidal Projection.)

tensive geographical base usually means abundant command of the resources of life and growth, Asia is especially well provided with the necessary factors favoring a variety of human occupations. It contains more cultivated land than any other continent and more than one-half of the world's population (Figs. 4 and 5).

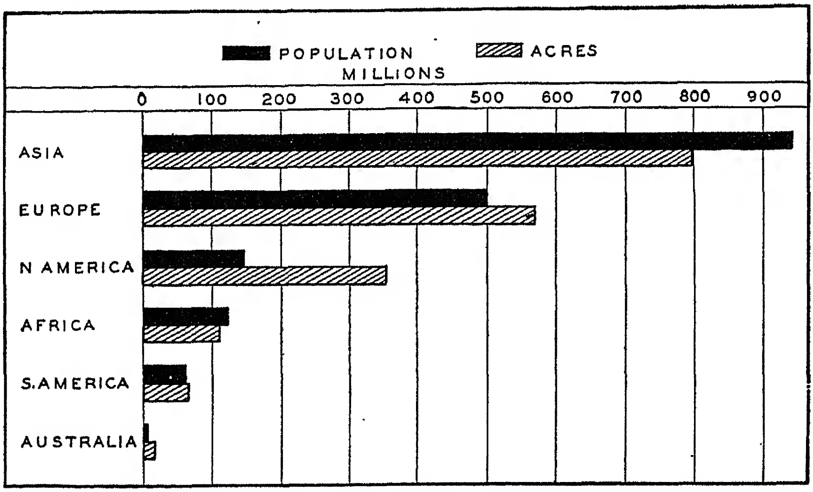

Fig. 5.—Relation of population to cropped area. (Modified from Griffith Taylor.)

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CHAPTER III

Physical Framework of the Continent

Physical framework and cultural diversity.—The structure of land masses influences fundamentally the movements and development of the peoples who inhabit them. Thus, simple land structures check differentiation, as is well indicated on the plain of European Russia or on the relatively uniform plateau of central Africa. In Asia, on the other hand, large, physically diverse peninsulas radiate outward; and vast corrugations of highlands and lowlands, snow capped mountains, and hot, enervating plains constitute a diverse geographical base. Here the complex development of mountains and plateaus built on different axes have provided the necessary variety of naturally defined regions and have helped make the people of this continent diverse in type and in occupation.

Preponderance of highland.—The continent has developed along bold physical lines, the great central mass consisting of a number of plateaus interrupted here and there by large mountain ranges (Fig. 6). These interior tablelands and mountains constitute the most extensive highland in the world; and of the various continents, Asia, therefore, has the greatest average elevation above sea level. From these interior highlands great rivers roll down vast supplies of fertile mud, depositing them in river plains which have become the home of the greater part of Asia's teeming millions—especially in the southern and eastern parts of the continent where the climate favors agricultural production during the greater part of the year. It is, however, an error to think of these rivers as rising only on the outer flanks of mountains, since they commonly originate within the plateaus and force their way through rocky barriers to reach the peripheral lowlands of the continent.

Interior highlands.—The vast interior tablelands of Asia broaden to the eastward and converge westward in the Great Pamir, a highland knot, known as the "Roof of the World." The Pamirs, indeed, constitute the main divide of this vast east-west highland system, separating the very extensive eastern from the more narrowly defined western part (Fig.

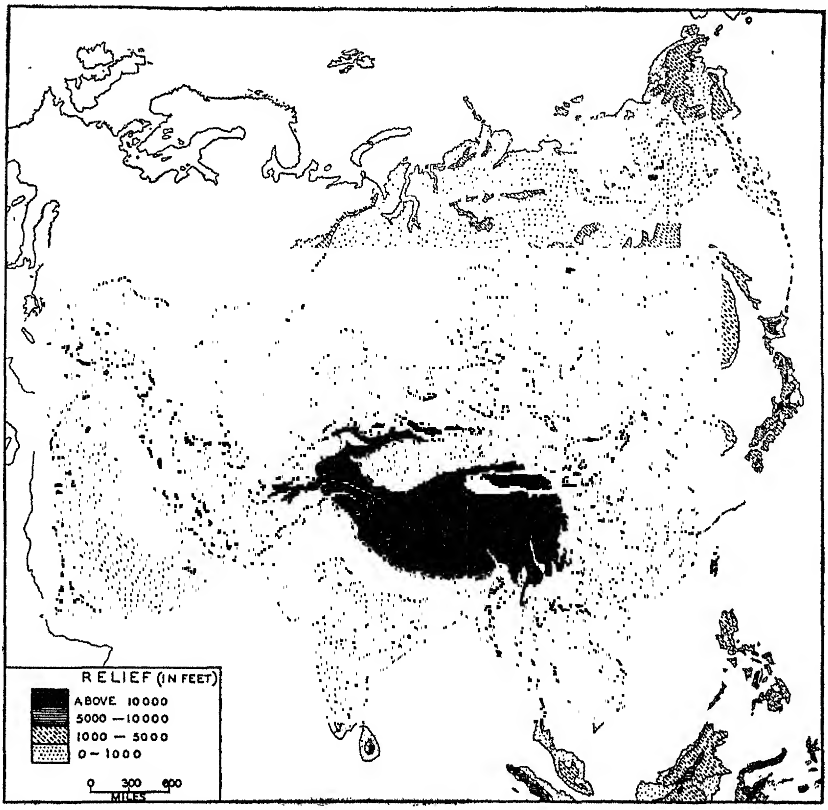

Fig. 6.—Relief of Asia plotted on Lambert's Azimuthal Projection. (Elevations according to J. Paul Goode.)

6). Westward, beyond the Great Pamir, these tablelands continue in the form of the Iranian Plateau, which stretches from the Hindu Kush Mountains across Afghanistan, Baluchistan, and Persia. Still farther to the west the highlands converge again in the mountains of Armenia, beyond which stretches the plateau of Anatolia.

East and northeast of the Pamirs, the vast tablelands of Asia comprise an area which is at least as large as the entire United States. These large interior highlands consist mainly of plateaus whose summits are at different levels. In some places the plateaus are intersected by mountain ranges, elsewhere they are flanked by some of the most stupendous rocky walls known to man. Thus, the great Tibetan Plateau, located between the rampart of the Himalayas and the Kunlun Mountains, maintains an average elevation of 14,000 to 17,000 feet above sea level. Northward beyond the eastern extension of the Kunlun the land drops almost abruptly to the desert of Gobi, where the average plateau elevation is only 4,000 feet above sea level (Fig. 6). On the other hand, the land located north and west of the Kunlun ranges comprises the great central depression of Asia known as the Tarim Basin. This basin, flanked on the northwest by the Tien Shan Mountains and on the south by the ranges of the Kunlun, has an average elevation of 3,000 to 4,000 feet, except in the reedy, saline swamps of Lop Nor, which sink to even lower levels.

In these vast interior regions the relief of the land affects either directly or indirectly at least six conditions: (1) climate; (2) vegetation; (3) soils; (4) arable land; (5) communication; and (6) density of population. By reason of their elevation above sea level, these highlands have lower temperatures than plains located in similar latitudes; and the steep windward mountain slopes intercept the moisture-laden winds which blow from the seas, especially during the time of the summer monsoon. Barriers to the south of the region are most effective in causing a small amount of precipitation, as is well indicated in the Himalayas, which in turn are backed by the most extensive of high plateaus (Tibet). Air currents moving from the south come from warm areas and therefore have a high moisture-holding capacity. In addition, this air actually contains much moisture since it passes over tropical seas. But the high rocky walls of the Himalayas and other ranges along the southern part of this great mid-continent highland intercept the air currents, which expend

their moisture, leaving the vast interior plateaus semi-arid or arid in climate.

The low precipitation accounts for the fact that the vegetation is mainly of a dry land type, consisting of xerophytic grasses and shrubs—plants utilized by the livestock of pastoral nomads. Trees are found only on the windward slopes of mountains, or where river valleys provide a sufficient amount of moisture. Yet, even in the valleys, grasslands are most common; and the valleys have long been the chief channels of transportation of central Asiatic caravans, since both pasturage and water are found there.

Climate combines with vegetation to explain the soil groups of these highlands of Asia. The soils are generally unleached by reason of the low precipitation, and they are consequently well supplied with essential mineral plant foods (phosphorus, nitrate, potash) and lime. They belong to the lime-accumulating soil division and where watered yield abundant returns, as reflected in the large harvests obtained per acre in the irrigated districts of inner Asia.

This combination of scant precipitation, little vegetation, and potentially productive soils suggests the status of land utilization in this part of Asia. Here arable land is limited mainly to districts where water may be obtained for irrigation, and most of this mid-continental region contains land which is devoted chiefly to pastoral nomadism. The high, cold, rugged, and inaccessible mountains, on the other hand, remain largely as waste lands. Communication in the latter is difficult. Routes of travel avoid the rugged highlands and seek the mountain passes and lowlands, especially the valleys where irrigation agriculture could develop. Here some of the most important transcontinental commercial routes have had a long and important history. Noteworthy among these are the routes which follow the margins of the Tarim Basin, extending from one oasis to another. The importance of Khotan, Yarkand, Kashgar, and other centers in the Tarim Basin has been due in large measure to their location on these routes of travel.

Highlands of southern Asia.—To the south of the vast east-west trending system of folded mountains are found the three large peninsulas of southern Asia. Two of these—the Arabian and Indian—are distinctive in that they are made up in large part of ancient plateaus, as indicated by the preponderance of hard rocks, such as the crystallines. Both peninsulas are bounded on the north by extensive lowland areas which connect them with the Asiatic land mass; and both of these lowlands—the Tigris-Euphrates Valley of the Arabian Peninsula and the Indo-Gangetic Plain of India—have been formed by the deposition of sediment washed from the adjacent highlands. Again, in their physical structure both peninsulas suggest former widespread land contacts with Africa rather than Asia. Thus, even at present the Arabian Peninsula is separated on the west rather incompletely from Africa by the deep but narrow Red Sea. In fact, the structural similarity with Africa suggests that the Arabian Peninsula may be a fragment of that continent.[1] Moreover, there is some geological evidence to support the contention that peninsular India, or the Deccan Plateau in its larger sense, was at one time united to a greater African continent. Like a large part of that continent, the Deccan is basically an old crust-block with relatively steep sea edges, especially on its western side.

As one of the oldest land areas of the world, the Deccan Plateau has not been submerged beneath the sea which forms its boundary on either side. It is flanked on the west by a conspicuous and important highland unit known as the Western Ghats, which parallels the western coast, forming an imposing scarp and barrier through which access may be had to the interior part of the peninsula by way of certain passes, or ghats, a term now generally applied to the range as a whole. Along the eastern face of the peninsula is another highland, which is somewhat similar to the Western Ghats, though occurring on a smaller scale—a highland that

[1] Newbigin, Marion: *A New Regional Geography of the World,* Harcourt, Brace and Co., New York, 1929, p. 149.

is commonly called the Eastern Ghats. This highland has neither the continuity nor the importance of the Western Ghats, being broken by a succession of river valleys that drain the Deccan.

The peninsula of Indo-China, together with the Malayan area, constitutes the third major southward extending projection of Asia. Unlike the highlands of Arabia and India, most of those of Indo-China are north-south trending ranges. The vast east-west chains of the folded Himalayas bend southward in the Indo-China Peninsula, giving a pronounced linear pattern to the natural landscape. These highlands have their intervening valleys, some of which reach considerable proportions, such as the Irrawaddy of Burma, the Menam of Siam, and the Mekong of French Indo-China.

These three vast extremities—Arabia, India, and peninsular Indo-China—which Asia thrusts equatorward possess different environmental conditions and a diverse geographical base for human activities. Thus, there are certain distinguishing characteristics of each major area which set it off from the rest. The westernmost, or Arabian, peninsula is mainly a sparsely peopled arid land devoted to pastoral nomadism; whereas the Indian Peninsula is given in large part to crop production because of the monsoonal climate with its maximum amount of precipitation during summer, the season of greatest plant growth. Its relatively dense population, its sub-continental proportions, its diversity of religion, language, and human occupations are some of the distinguishing characteristics of this vast Indian area which set it off from the arid parts of southwestern Asia. Like India, the peninsula of Indo-China has a monsoonal climate, but differs from the former area in several ways. Thus, when the traveler has left India and entered Burma, an area which is politically a part of the former country, he has bid farewell to the Aryan and entered the land of the Mongol. Similarly, Siam and French Indo-China, other political units of this peninsula, contrast with peninsular India in race, in religion, in density of population, and in

various other respects. Densely populated India is one of the world's largest rice consuming regions, with nearly all of the production of this commodity being required at home for her hungry millions; whereas Indo-China with its moderate population density constitutes the major rice exporting region of the commercial world.

Life zones in the highlands of southern Asia.—The life zones of these highlands are commonly so closely compressed that in some places it is but a day's journey from snow fields to tropical enervating plains. Some of the most well defined natural boundaries are seen on these highland slopes, where the traveler may pass from tropical lowland through subtropical and temperate climatic belts into the upper highland reaches, which correspond climatically to our polar regions.

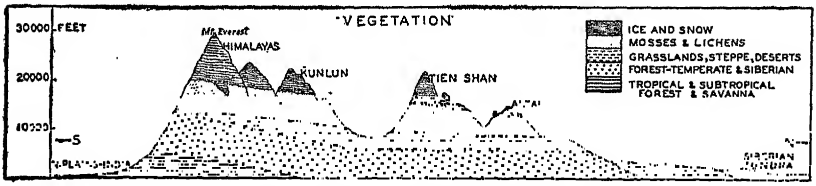

Fig. 7.—Generalized map showing vertical distribution of vegetation. Latitudinal cross section from the Upper Ganges Valley northward. (Modified after John Bartholomew.)

Each belt has its distinctive vegetative types and each possesses certain opportunities and handicaps as natural habitats for human development (Fig. 7). By reason of their lower temperatures, tropical highlands commonly become places of refuge during the hot season, when the enervating weather of the lowland makes living almost unbearable, especially for people accustomed to the temperate zone. Thus, along the southern slopes of the Himalayas, hill stations have been established to which people and government move during the most oppressive time of the year. These stations are of major importance, affecting the welfare of the average European who finds respite from the enervating climate of the Indo-Gangetic lowlands.

Intensive cultivation in tropical and subtropical highlands.—In various parts of tropical and subtropical Asia the pres-

sure of population upon the land and natural resources is so great that even relatively steep slopes have been brought under cultivation. Where the precipitation is sufficiently abundant for crop production, terraces have been built and in many places extend upward in the form of giant steps from the adjacent lowlands. Such terraced slopes are quite common in the southeastern and eastern island fringe of the continent. In the Philippines, thousands of miles of terraces extend throughout various parts of the archipelago (Fig. 8). Such intensive utilization of the land also charac-

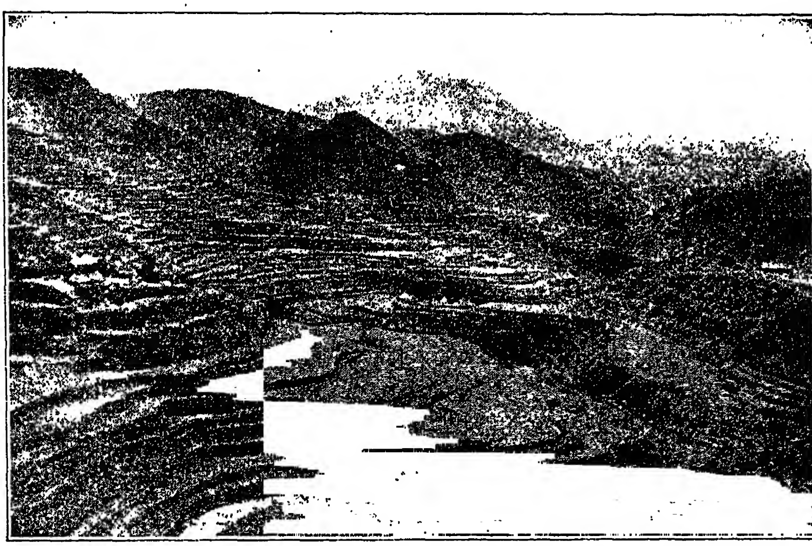

Fig. 8.—Banaue and its rice terraces. (Courtesy of the Bureau of Science, Manila, P. I.)

terizes the more densely populated parts; and in Japan terrace culture has crept up the slopes of a number of volcanic highlands, and in a few cases even the interior craters of extinct volcanoes are utilized.

Yet in spite of this intensive utilization of the land and the widespread practice of terrace agriculture, there are vast tracts of highland which for all practical purposes will remain as waste land. Thus, only 15.6 per cent of Japan proper is classified as cultivated land, and the Philippine

Islands have an even smaller proportion under the plow. The greater population densities and the highest percentage of cultivated land are not found in these highlands, but rather in the lowlands, especially in the river plains where areas of recent as well as "old" alluvium constitute the geographical base of the most densely peopled regions of the continent. Various of these highlands of tropical and subtropical Asia will be studied in greater detail in other chapters of this book.

River plains.—Some of Asia's most densely populated areas are the river plains. The level land surface, fertile transported soil materials, and the ease of irrigation, where the precipitation may be insufficient in amount or erratic in occurrence, constitute primary factors explaining the noteworthy agricultural development which has taken place in these lowland areas. In addition, the level to gently undulating surface favors transportation and, therefore, the ready interchange of goods and ideas. Asia contains many river plains, too many, indeed, to be considered separately at this point; and we will therefore center our attention about some generalized considerations pertaining to a few of these Asiatic lowlands, such as the Tigris and Euphrates, the Indo-Gangetic Plain, the major river valleys of peninsular Indo-China, the valleys of China proper, and the river plains of northern Asia.

The land of the two rivers.—The Tigris-Euphrates river system, located in the arid and semi-arid lands of southwestern Asia, is one of the distinctive lowland regions of the continent. Here early civilizations took their rise, especially on the alluvial flats near the Persian Gulf. In this favored region extensive and successful agriculture resulted in the growth of brilliant empires, with centers at Babylon, Nineveh, and Bagdad. The empires which developed here during various periods of history were based on agriculture, the two rivers in this climate of low precipitation supplying the necessary water for the growth of crops. Prosperity,

however, left the region when it fell under Turkish control.[2] Canals were destroyed, and extensive areas of cultivated land became waste owing to the broken and choked up irrigation channels.

In this huge Mesopotamian trough the Tigris and Euphrates roll down never-failing supplies of river mud, drawn from the adjacent highlands. This significant lowland, therefore—which not long ago, geologically speaking, was part of a much extended Persian Gulf—has been built up out of the materials washed from the highlands that close it to the landward (Fig. 6). Weathering on the lofty Armenian highlands and the Persian scarp has provided vast quantities of material whereby the united streams have been enabled to advance their shorelines at an appreciable rate; in fact, to the extent of one mile in thirty years.

The Indo-Gangetic plain.—The lowlands of the Indus and Ganges Rivers separate the great folded mountain system in the extreme north of India from the peninsular plateau structure of that country. This vast lowland, stretching from the Arabian Sea to the Bay of Bengal, comprises approximately 300,000 square miles of land, a unit larger than the combined areas of the United Kingdom and Germany. This lowland, which is the richest and most populous natural division of India, contains some of the largest and most important cities and produces a large share of India's economic goods, especially jute, rice, sugar cane, and wheat.

The Indo-Gangetic Plain may be considered a vast stretch of alluvium of unknown depth, apparently formed by the filling in of a former trough that once separated the Deccan from the mainland of the continent. Here two kinds of alluvium are found: (1) coarse gravelly deposits that fringe the hills at the foot of the highland girdle; and (2) "old" alluvium (bhangar), as well as much newer deposits of fine sands, sandy loams, and clays commonly called the "new" alluvium or khadar. It is in the pockets of recent

[2] "Grass dies under the Turkish hoof."

clay alluvium that many of the wells of the Ganges Plain have been dug; since wells of considerable stability can be dug in the clay, and water from the saturated sand around may be admitted.[3]

Separated from the Ganges Plain by a low water-parting, the lowlands of the Indus constitute a major geographical continuation of that of the former (Fig. 6). In its upper part, the Indus Basin occupies the Indian province called Punjab, which receives the waters of its five great rivers (Jhelum, Chenab, Ravi, Sutlej, and Beas). This region has low rainfall; hence, irrigation by means of canals has become an important activity, and the Punjab contains more canal-irrigated land than is found in any other political division of India. Below the Punjab the united streams of the upper Indus Basin flow through the desert province, Sind, a political unit comparable in some respects to Egypt. Like the Nile Valley of Egypt, the lower Indus is located in a tropical desert (the Thar Desert), where the land becomes enriched by the overflows of the Indus. Hence, this valley has become a narrow ribbon of fertility extending through a desert. Unlike the Nile, however, the Indus does not follow a well-defined and constricted channel, but for much of its length in the flat, sandy plain of Sind, the river bed has been unstable and has often changed its course, sometimes by many miles in a single flood season. Again, crop production in this desert area has long been possible because of the inundation of the valley lands. The waters begin to rise in May and subside in September, the height and regularity of the floods depending on the melting of the snows in the Himalayas and upon the rainfall in the Punjab where the major tributaries of the Indus are located. The region has therefore suffered from the short period of irrigation and uncertainty of crop production, the latter being associated with fluctuating climatic conditions in the upper part of the Indus Basin. In order to overcome this irregularity in crop production and to enable a more continued cropping

[3] Carrier, E. H.: *The Thirsty Earth,* Christophers, London, 1928, pp. 122-124.

during the year, the Lloyd Barrage Canal system was recently completed (Jan., 1932), the barrage being located below the gorge of the River Indus, between Sukkur and Bokri. By means of this project it is expected that five to six million acres will be cultivated annually, an area exceeding the present cultivated land of Egypt. Just as the Egyptians found it more economical to change from the former practice of basin system of irrigation, so the inhabitants of this region are beginning to abandon their old highly seasonal and uncertain practice of "inundation irrigation" for the perennial diversion canal system of supplying water to the growing crops.

River valleys of peninsular Indo-China.—A population map indicates forcibly the significance of the river valleys of southeastern Asia as a home for man. These valleys occupy the hollows between the north-south trending folds which bend to the southward from the fold-mountain system of central Asia (Fig. 6). Especially significant among these valleys are the Irrawaddy of Burma, the Menam of Siam, and the Mekong of French Indo-China. Each of these constitutes the most significant geographical unit of the country in which it is located, and each is served by an important port—Rangoon on the Irrawaddy, Bangkok on the Menam, and Saigon on the Mekong. Together these river valleys make up the most important realm of commercial rice production in the world.

The Si Kiang Basin.—The Si Kiang, or West River, Basin is one of the major geographical units into which China proper is divided. It forms a unit that has some distinguishing characteristics, being cut off to a large extent from the rest of China. It is separated from its northern neighbor, the Yangtze Basin, by a continuous line of highlands, although a few low passes allow communication between the areas—the most important of which, historically, is the Meiling, or Plum Tree Pass, located north of Canton. With the exception of the narrow valley bottoms and small deltas of its streams, the basin of the Si is a high, dissected plateau

in which there is considerable terracing of hillsides where soil conditions permit. Agriculture is especially well developed in the Canton delta region, a fertile alluvial area producing tropical and semi-tropical crops, such as rice, sugar cane, and tea. Because of numerous rapids and shallows, the Si River is navigable only to Wuchow (a distance of 125 miles) for vessels of more than six and one-half feet draught. Smaller boats and barges, however, are freely used on various of the tributaries as well as in other parts of the main stream.[4]

The Yangtze Valley.—The Yangtze is the most important waterway of China, and the basin drained by this river and its tributaries is the most important industrial and commercial region of the country, containing approximately 180,000,000 people and a number of China's large cities, such as Hankow, Nanking, and Shanghai. This basin contains several lowland units, separated from each other by effective barriers. The only contact between these units is by means of the Yangtze River itself. One of the most fertile and densely populated of these lowland units is the basin of Szechwan, which is located at a distance of approximately 1,500 miles from the mouth of the Yangtze River. Here the population density, especially in the Chengtu Plain, is very high, ranging from 1,800 to 2,000 people per square mile. The fertile soil, the mild climate, and elaborate system of irrigation make possible a high-maintenance level per unit of land, rice being the chief crop. Further down the Yangtze, and separated from the Red Basin by the region of the Yangtze Gorges, is the basin of Hupeh, a lowland which contains the famous Wu cities of Wuchang, Hanyang, and Hankow. Still farther down the river is the lowland delta region in which Shanghai is located.

The Yangtze is the chief natural channel for making the interior of China accessible to the outside world, and with respect to navigation this river may be divided into three sec-

[4] Roorbach, G. B.: "China: Geography and Resources," *American Academy of Political and Social Science, Publication No. 652* (Jan., 1912), p. 135.

tions: the lower river, from Shanghai to Hankow; the middle river, from Hankow to Ichang; and the upper river, from Ichang to Chungking and from Chungking to Suifu. Ocean-going vessels drawing 18 to 20 feet of water come to the wharves of Hankow, located 680 miles from the ocean. But navigation is extremely hazardous in the upper parts of the river bed, where great numbers of coolie laborers are engaged in pulling shallow river junks through the many rapids and gorges.[5]

The Hwang Ho Valley.—As a home for man the Hwang Ho Valley is one of the most important geographical units in Asia. It comprises the region known as north China. The plain built up in this region from alluvial materials and loess is occupied by many millions of Chinese, most of whom are farmers. But intimately associated as it is with the history of the Chinese, the Hwang Ho (Yellow River) has often been the destroyer as well as the life-giver. In fact, this river has frequently changed its course during past ages, flowing alternately north and south of the mountains in Shantung Province, and reaching the sea at points as much as 250 miles apart.[6] These extensive floods of the Hwang Ho are associated with the marked seasonal as well as erratic precipitation, with a tendency at times for periods of great abundance of rainfall. Such conditions are further aggravated by the generally forest-denuded slopes and consequently the rapid run-off. In addition, vast quantities of soil are washed from the loess-covered hills of western north China and deposited in the lower part of the valley, thereby raising the stream channel so that the river flows on rather than through the plain. The tremendous quantity of silt deposited in its channel limits the value of the Hwang Ho as a waterway, and makes it necessary for the farmers to engage in a struggle to prevent their fields from unseasonal floods. The porous soil is unsuitable for rice even where the climate favors the production of this leading cereal of the Orient. North China, in fact, is a millet, wheat, and

[5] *Ibid.*, p. 136.
[6] Clapp, F. G.: "The Hwang Ho," *The Geog. Rev.*, Vol. 12, p. 18.

sorghum producing region rather than a producer of rice.

River plains of northern Asia.—Unlike the large river plains of southern and eastern Asia, those of the northern part of the continent are sparsely peopled, yet the population distribution charts of the Russians disclose the significance of these rivers and river valleys—such as the Yenesei, the Ob, the Lena, and the Amur—in the distribution of settlements and as a means of communication. These river plains, however, are handicapped by their location in climates characterized by short summers and long, extremely cold winters. In addition, the northward course of the rivers presents other disadvantages. Thus, the lower, northern parts remain frozen during the spring and early summer months while the middle and upper courses are melting, the impounded waters inundating vast areas and creating extensive marshes and swamps. Although various of the rivers of northern Asia offer thousands of miles of valuable summer navigation, they feed an ocean that is either frozen or obstructed by ice during the greater part of the year.

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CHAPTER IV

Climate, Vegetation, and Soil

Climatic extremes.—The climatic conditions are greatly influenced by the size of the continent of Asia and by the direction of the mountain ranges. Because of the great area, the interior is remote from the moderating influence of water, and the central plateaus and fold mountains act as barriers to warm influences from the south. The winters are, therefore, much more severe than in the corresponding area in North America; in fact, the lowest recorded temperatures are found in the northeastern interior of Siberia, at Verkhoyansk, where the thermometer has fallen to 90° below zero. The continentality of the interior of Asia is further reflected in the pronounced heating in summer, especially in the arid parts. In addition, the remoteness of large divisions of the continent from sources of moisture supply and the presence of land and highland barriers to the windward have caused low precipitation to prevail over large areas.

The monsoon.—Derived from an Arabic word signifying "season," the term "monsoon" is used to express the seasonal winds which result from the pronounced continental cooling of the land in winter and heating in summer. In winter the vast interior land mass of Asia cools rapidly, the temperature falling greatly owing to excessive nocturnal cooling. By reason of the intense cold the barometric pressure rises, and the extratropical zone of high pressure shifts northward, forming a vast anticyclonic area (hyperbar) over inner Asia, with its center near Lake Baikal (Fig. 9). From this high pressure area cold, heavy air flows out clockwise, this being the well-known winter or "dry monsoon." During the warm season, on the other hand, the land heats rapidly, the abnormal high-pressure system of winter is dissipated, and an area of low barometric pressure

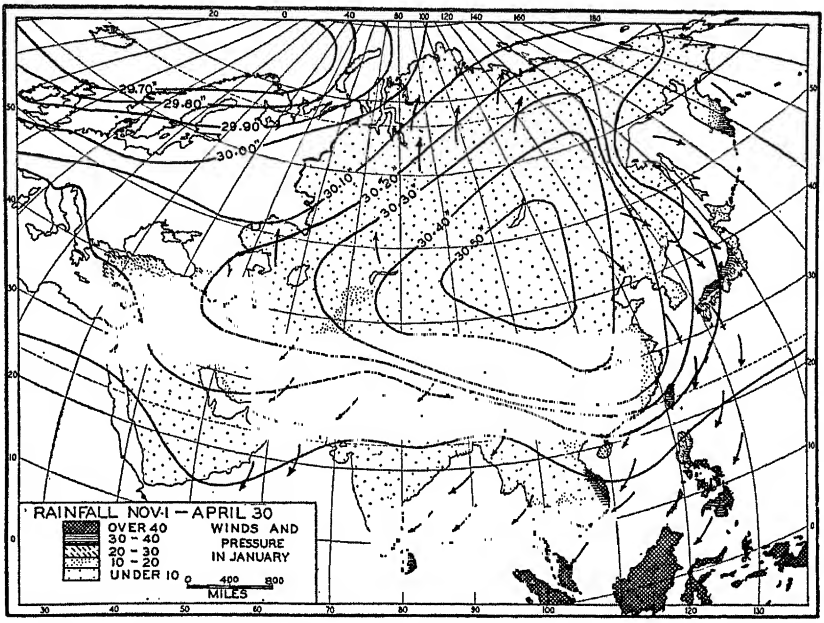

Fig. 9.—Atmospheric pressure and wind direction during January together with rainfall in inches from November 1 to April 30. (Plotted on Bonne's Projection.)

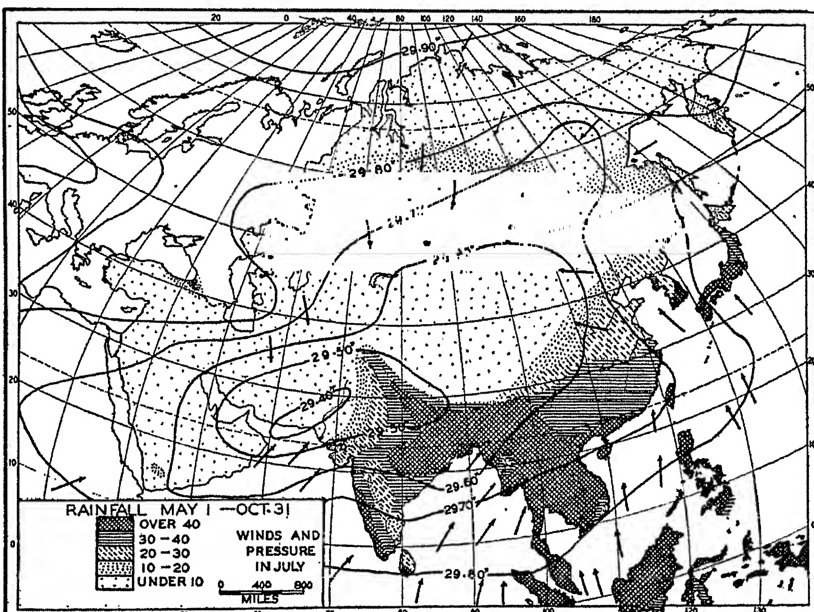

Fig. 10.—Atmospheric pressure and wind directions during July, as well as rainfall in inches from May 1 to October 31. (Bonne's Projection as base map.)

takes its place, the center of lowest pressure being located over northwestern India with a vast secondary extension spreading northeastward through the greater part of the continent (Fig. 10). The pressure change results in a reversal of the winds and a pronounced seasonal distribution of precipitation.

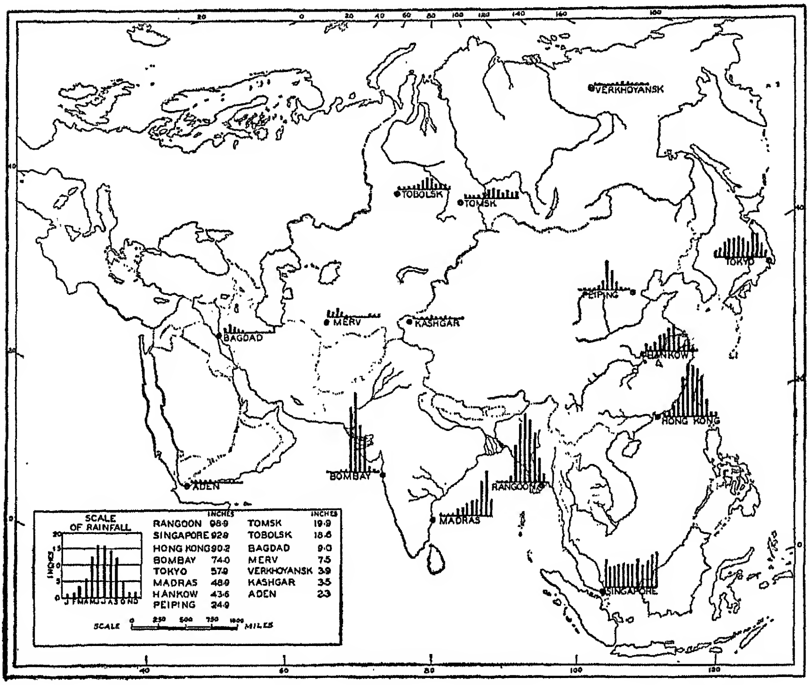

Fig. 11.—Mean monthly distribution of precipitation at selected stations in various parts of Asia. (Based on primary meteorological records.)

This marked reversal in wind direction affects man in various ways. In early times navigators would judge their voyage in such a way as to arrive at Asiatic ports during the period of the inflowing summer monsoon, and they would be aided in their departure by the outflowing winds of winter. These climatic conditions have long been taken into account by those who sought the precious stones and tropical products of India. Of even greater geographical significance is the relationship of this wind system to precipitation. For the continent as a whole, summer is the time of greatest precipitation, since the winds

are blowing from the sea to the land, bringing especially great downpours of rain in the southern and eastern divisions (Fig. 11). In southern Asia reference is often made to the "bursting of the monsoon," meaning thereby the sudden change of weather accompanying the setting-in of the southwest mon-

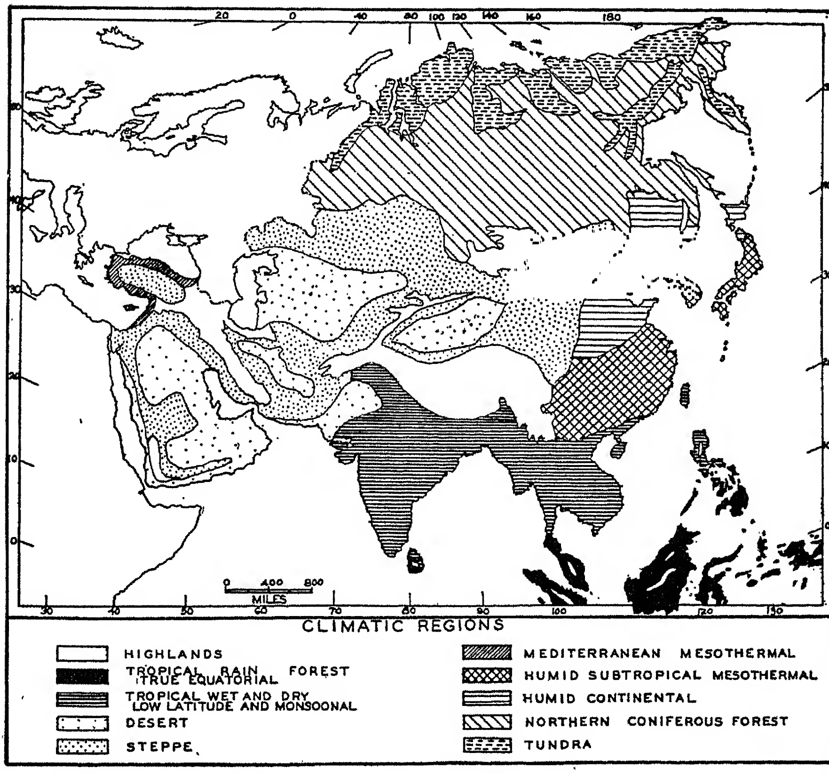

Fig. 12.—Major climatic regions of Asia. (Map based on records obtained from Koppen, Herbertson, Kendrew, Hann, and others, plotted on Bonne's Projection.)

soon, which marks the beginning of the rainy reason. Since the most abundant rainfall is experienced during the period of greatest heat, monsoonal lands are favored as crop-producing areas capable of supporting large human agglomerations. Yet the winter season is generally deficient in precipitation, with the exception of land areas located transversely to winds blowing over bodies of water. Such conditions for example, are

found in southeastern India, eastern Annam, and western Japan proper (Fig. 11).

Regional variety.—Although the monsoon is the best-known feature of Asia's climate, a great variety of climatic conditions prevails, and a number of separate regions may be recognized

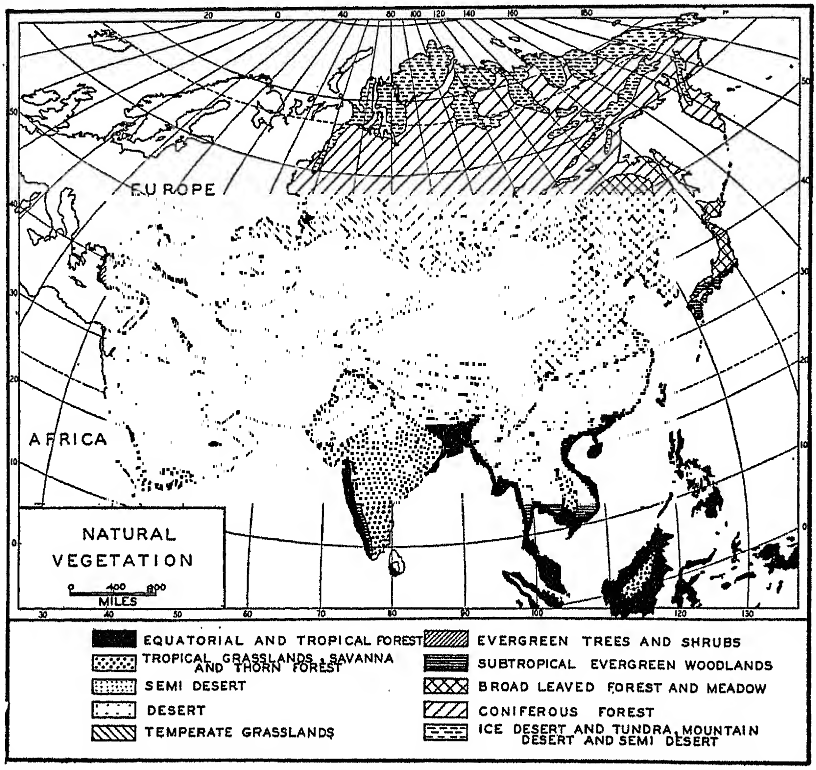

Fig. 13.—Major vegetative regions of Asia. (Plotted on Bonne's Projection.)

(Figs. 12 and 13). In fact, the climatic range is from the tropical rain forest to the tundra.

The only major climatic realms lacking in Asia are the marine (west margin of continents in higher middle latitudes) and the polar. The following list indicates the marked areal differentiation with respect to climatic types:

1. Tundra.
2. Northern coniferous forest.

3. Humid continental:
   a. Humid continental with short summers.
   b. Humid continental with long summers.
   c. Modified humid continental.
4. Temperate zone desert and steppe.
5. Humid subtropical (mesothermal and monsoonal).
6. Mediterranean (mesothermal).
7. Tropical desert and steppe.
8. Tropical wet and dry (monsoonal and low latitude).
9. Tropical rain forest (true equatorial climate).
10. Highland types.

The tundra.—In the extreme north is tundra, the northern margin of which is the Polar Sea. Although the precipitation in the tundra is low, the temperatures are also sufficiently low. Thus, evaporation proceeds slowly and moisture is usually found in superabundance. Since the subsoil never thaws, the ever-present perpetually frozen stratum prevents the filtration of surface water into deeper strata, thus leaving the soil saturated with water and giving rise to extensive swamps.

Because of the prevalence of strong winds in these northern areas, snow does not lie deeply on the ground, and the cold of winter makes it necessary for most of the people of the tundra to seek shelter in the forests to the south in order to avoid the rigors of this season. The climate is so severe that vegetation does not thrive, and so the natural landscape is characterized by extreme barrenness and monotony. The vegetation is adapted to the short period of growth, the plants being mainly perennial herbs, although in the more sheltered spots a few berry-bearing bushes may be found. The only trees are dwarf birches reaching a height of only a few inches and generally creeping on the ground. Mosses predominate in the low, swampy areas and in some places form a cover of five feet or more in thickness.

The northern coniferous forest.—South of the tundra are vast forests, in which the climate is characterized by long winters, short summers, and extremes of temperature. Seven months of winter and three months of summer are connected by

but a month of spring and an equal period of autumn. The lowest recorded temperatures have been found along the northern margin of this region, in the general district of Verkhoyansk, Siberia. Precipitation is not great, but since the temperatures are low, evaporation in the forests is light and the soils are, therefore, generally soggy.

A few valuable raw materials, such as furs and precious metals, are coming out of this northern region; but the chief potential resource is timber. Here the forest zone extends over practically all of Siberia, from the Urals to the Pacific. These Siberian forests, usually known as "taiga" (virgin forest), do not occur in unbroken tracts, since they are intersected by innumerable streams whose valleys consist of marshes and meadows, with here and there a forest stand. The forests generally are found not in the river valleys, but in the interstream watersheds. Owing to the vast extent of this northern region, the total forested area covers more than a billion acres of land, an area much larger than all the forests of Europe. The most important trees in the taiga are the pine, larch, Siberian true fir (Abies), spruce; and in Amur and eastern districts are found Ayan spruce, Manchurian cedar (Pinus manchurica) and a special kind of pine (Pinus funebris).

Humid continental climate.—The northern coniferous forest is flanked on the south by the timber-using plains of the Siberian spring wheat belt, an eastward continuation of the wheat region of European Russia. Here the climate is humid continental with a relatively short growing season of three to five months, and constitutes a counterpart of the spring Wheat Belt of North America. This climate also covers the northern part of Manchukuo, where it gives way farther south in Manchuria, as well as in the Hwang Ho Basin, to the humid continental type with long summers (five to six months). To the eastward—in northeastern Korea, northern Hondo, and the island of Hokkaido—the moderating influence of water modifies the climate, thereby creating the modified humid continental type, which has its counterpart in the New England region of North America.

Where forests are found, they commonly consist of mixed stands of coniferous and deciduous trees. In the drier areas of this climatic realm, grasses occupy the interstream areas and the forests follow the river valleys. In the Hwang Ho Basin, however, tree cover is almost lacking; but extensive forests are found in northern Manchukuo as well as in the modified humid continental climate farther east.

Temperate zone desert and steppe.—A large part of inner Asia consists of middle latitude arid and semi-arid lands, where the precipitation is mostly too low to permit of crop production without the aid of irrigation. There are three major regions which may be described as middle latitude steppe and desert: (1) The Turanian region (Western Turkestan), which includes the Caspian-Aral area and the Turkoman Desert; (2) the Taklamakan Desert and adjacent steppe occupying the Tarim Basin or Chinese Turkestan (Eastern Turkestan); and (3) the Gobi Desert, with its peripheral expanses of steppe, which stretch to the northeast. These areas are flanked on the south by extensive land areas and high mountains and plateaus, and they are therefore cut off from the chief source of moisture, that is, from air currents crossing tropical seas and moving from lower (warmer) to higher (colder) latitudes. Air coming from the cold north holds but little moisture to begin with, and moving southward increases its moisture-holding capacity. No precipitation, therefore, can be expected from this direction. To the east and west, expanses of land separate these interior arid regions of Asia from the Pacific and the Atlantic. The significance of the land barrier to the eastward is nicely shown in the decreasing isohyets associated with distance westward through China proper into Mongolia. Regions located farther south would, consequently, appear to be the logical sources of moisture supply, but here are extensive plateaus and the world's highest mountain ranges, which effectively separate this interior part of the continent from the moisture-laden winds brought northward during the time of the summer monsoon.

The vegetation of these regions varies from the scattered xerophytic bunch grass and scrub characteristic of desert

regions to the solid stands of native grasses in the better-watered parts of the steppe. Even in the steppe, however, there are vast stretches of land covered with short grass or with scattered clumps of tall grasses. These regions, consequently, are widely used for the grazing of livestock, although in some of the better-watered sections dry farming is encroaching upon the pastoral nomad.

Semi-tropical climate (mesothermal).—Asia contains both of the semi-tropical or mesothermal climates: the mediterranean and the humid subtropical. The former, characterized by winter rain and summer drought, is located in the southwestern part of Asia; the latter reaches its widest distribution in the Yangtze Valley and in Japan. In southwestern Asia, especially in coastal Anatolia, Syria, and Palestine, the winter rainfall is associated with southward migration of the westerly wind belt during winter, and the eastward movement of cyclones over the Mediterranean Basin. In the Yangtze Basin, on the other hand, there is a dry season in winter, the summer maximum of precipitation being associated with the inflowing air currents during the summer monsoon. Japan, however, by reason of its island location, shows rainfall all through the year. During the summer monsoon the southeastern parts of the archipelago receive the greater amounts of rainfall, whereas in winter the air currents moving out from the Asiatic mainland absorb moisture over the sea of Japan, which is expended mainly in the western parts of the islands. Thus, Kanazawa, located in the west-coast region, receives 32 inches during the three winter months (December, January, February) as compared with 22 inches during summer (June, July, August). On the other hand, Tokyo, located in the southeastern coastal district of Japan, receives 16.5 inches of rain during summer and only 7 inches in winter.[1]

Contrasts in the climate of mediterranean and humid subtropical lands are matched by marked differences in the native

[1] Kendrew, W. G.: *The Climates of the Continents,* The Clarendon Press, Oxford, 1922, p. 141.

vegetation. The mediterranean, with its winter rain and summer drought, is characterized by native plants such as the olive, the myrtle, the pomegranate, the evergreen oak, the fig, and the vine (Vitus vinifera). Humid subtropical Asia, on the other hand, contains woodlands in which deciduous trees predominate.

Low latitude desert and steppe.—These climatic types are widely distributed in southwestern Asia, extending from Arabia into northwest India. Here the climate is hot and dry, with average annual temperatures over 64.4° F. The summers are characterized by hot days and comfortably cool nights, whereas the winters are cool for that latitude. Here the prevailing winds blow from northerly points during much of the year—northwest in summer, northeast in winter. Air currents moving from the northern (colder) to southern (warmer) latitudes become warmer and increase their moisture-holding capacity, and precipitation is, therefore, generally not associated with such winds, especially where they have originated over the land and move equatorward over other large land areas.

Like the middle latitude desert and steppe, the semi-arid and arid lands of low latitudes are areas of widely scattered bunch grass, desert shrub, and other dry land types of vegetation. In fact, the low latitude location places the dry regions under the more direct rays of the sun and evaporation is therefore greater than it is in the dry lands of middle latitudes. Under these conditions pastoral nomadism becomes a significant occupation, except in districts transversed by rivers rising in distant mountains and thereby deriving water for various kinds of plants, as in the Tigris-Euphrates and Indus Valleys. Occasionally, however, the rivers and streams are underground, and from them water may rise to or near the surface owing to the capillarity of the porous soil. Thus, we find the oases, which exist as islands and narrow ribbons of productivity in a sea of desert. These areas have relatively unleached soils, and as a consequence of the abundance of sunlight natural to low lati-

tude arid lands, plant growth is vigorous and the harvest may be gathered several times a year.

Tropical wet and dry (monsoonal).—This tropical climate reaches its most widespread development in India, peninsular Indo-China, parts of the East Indies, and the Philippines. In most sections located within this large realm the rain falls mainly during the summer season and is associated with air currents moving into low pressure areas that develop over the continental mainland. While in southern and southeastern Asia as a whole the distinction between rainy summer and dry winter monsoon generally holds good, there are some parts, such as Annam and eastern Ceylon, which stand in the path of the winter monsoon and therefore constitute exceptions to the general rule. These and other regional differences will be discussed more completely in following chapters.

The vegetation of the low latitude wet and dry regions is extremely varied, and in few areas of the world will one find more striking contrasts in vegetation types. Where the rainfall is most abundant, luxuriant forests have sprung up, which in some districts contain commercially important trees. These forests are the chief source of teak, a tree that has long been demanded in the shipbuilding centers of the world. As one proceeds away from the forested areas, grasslands with parklike timber appear; and these in turn give way to the open savanna and thorn forest along the drier margins. Thus, in journeying from the Malabar coast of India, one sees this change from a heavy forest along the well-watered Western Ghats to parklike savanna east of these highlands—a response to decreasing rainfall from west to east in this part of peninsular India.

Tropical rain forest.—In passing equatorward from the lands which have a marked seasonal (wet and dry) rainfall, one enters a tropical realm which is characterized by constantly moist, hot conditions all through the year. Such climate is found in the Malay Peninsula, part of Ceylon, in most parts of the East Indies, and in the southern Philippines. Here uniformly high temperatures and well distributed rainfall enable

the production of tropical hydrophytic plants, and the plantation system of agriculture has reached a high state of development in these parts of Asia.

The rainy low latitude areas, especially islands in the East Indies, have a luxuriant covering of plants, some of which are in constant demand in various parts of the commercial world. Luxuriance, variety, and richness of coloring are outstanding characteristics of the vegetation of these tropical rain forests. Under the influence of abundant heat and moisture, plant life is more profuse in this region than in any other climatic division of Asia. The true rain forest, however, should be distinguished from what is known as jungle, since the former is usually found in the rich river plains, whereas the latter occurs in many of the interstream areas, on slope lands, and along streams where the sun's rays penetrate and make possible the growth of an entanglement of plant life.

Domesticated plants originating in Asia.—Asia contains not only many different types of native (or wild) vegetation, but also is the home of a number of domesticated plants. The Mediterranean region in southwestern Asia shares with other parts of the greater Mediterranean Basin in being distinctive from the standpoint of crop origin. Students of plant ecology disclose the fact that the Mediterranean region is the home of most of our cereals. Here, related forms of cereals grow wild, as, for example, the ancestral types of wheat which have been found on the slopes of Mt. Hermon, Syria. The Mediterranean region is also the native home of nut plants, such as the filbert and the almond, as well as a great variety of vegetables, fruits, and grasses. The Indo-Malay region further adds to the storehouse of domesticated plants, and is considered one of the most significant regions in the world from the standpoint of crop origin. Its chief contribution is rice, a cereal which still grows wild in India. The use of rice antedates history so far that we have no knowledge of where it first began. Jute, hemp, nutmeg, ginger, citrus fruits, and sugar cane are among the other plants that are believed to have originated in the Indo-Malay region. In temperate and semi-tropical eastern Asia

still other domesticated plants had their origin; among them we find the soy bean, tea, Japan clover, ginseng, and the mulberry.

Soils related to climate and vegetation.—The major soil groups of the world show a close relationship to climate, vegetation, and parent material.[2] Of these, climate and vegetation are primary factors.[3] Since Asia's climatic and vegetative types are diverse, the soil groups also show an areal differentiation from place to place. The soils of arid and semi-arid grasslands, for example, present striking contrasts to those of the tropical rain forest.

The soils of warm, humid areas.—The rain forest region of southern Asia is characterized by high temperatures and abundant rainfall. The former cause rapid chemical change, whereas the latter causes excessive leaching of the soluble products of the soil. In addition, the high temperatures favor chemical change because of the rapid decomposition of organic matter. The effects of this combination of climatic elements are shown in the generally low productivity of many tropical soils, such as the red-colored laterites. Exceptions to the general rule are found where relatively young soils have been formed in recently weathered volcanic materials, such as those found in some of the islands of the East Indies. Thus, densely populated Java constitutes an exceptionally fertile spot, considering its warm humid climate.

Fertile soils of steppe regions.—In the middle latitude steppe, the moderate rainfall and marked seasonal change in temperature affect the soil in various ways. Grasses grow luxuriantly in the better watered steppe during summer, whereas there is a relatively small destruction of organic matter in winter; thus such lands have dark-colored soils which are high in humus content. The soils, moreover, are high in mineral plant foods and lime. These general characteristics

[2] Material in which soils develop; such as, rocks, alluvium, glacial till, etc.

[3] Glinka, K. D.: *The Great Soil Groups of the World and Their Development,* Edwards Brothers, Ann Arbor, Mich., 1927. Translated from the German by C. F. Marbut.

are found in the fertile chernozem soil, which is widely distributed in the steppe of Asiatic Russia.

In the drier steppe regions the soils are lighter in color, since the plant growth is less abundant and the humus content is therefore lower than that in the better watered steppe lands. The soils in these parts of Asia vary in color from chestnut-brown to gray.

Soils of the desert.—With increasing drought the steppe soils give way to those of the desert. Because of the small organic content of desert soils, they are generally light in color and commonly tend toward sandiness, although the desert surface also contains areas of clay. In some places alkali soils have been formed, originating from the rise of ground water carrying saline matter in solution. Rising toward the surface by capillarity and evaporating under the influence of the sun and the dry air, the water leaves its dissolved load as a solid precipitate in the upper eight to twelve inches of soil. In some districts it forms a covering that is considered detrimental to plant growth.[4]

The gray forest soils.—Unlike the reddish-colored laterite which is so characteristic of the tropical rain forest, the soils of the forested areas of northern Asia are gray in color. In the northern coniferous forest the podsol (from the Russian: "soil the color of ashes") is the most widely distributed soil group. Its light-colored, leached surface soil is due to the bleaching through solution and to the removal of iron by humic acid solutions. Its subsoil is generally dark—being moderately high in slightly decomposed organic matter—and in many places contains iron concentration forming a cemented layer, which, when well established, leads to the development of heaths.

Soils of the tundra.—Poleward, beyond the northern coniferous forest, lies the tundra, with its hummocky surface and its general paucity of trees. Here the ever-present perpetually frozen stratum prevents the filtration of surface water into

[4] Carrier, E. H.: *The Thirsty Earth,* Christophers, London, 1928, p. 145.

deeper strata, and consequently the soil is saturated with water, giving rise to swamps.

The loess.—Although it is not related directly to the climate and vegetation of the area in which it reaches its most widespread development, loess is one of the distinctive soil materials of Asia and covers large stretches of the Chinese provinces of Kansu, Shensi, and Shansi. This material is essentially wind blown (aeolian), and shows a fine-grained non-stratified vertical cleavage.[5] As a vast body of surface material, the loess caps the older formations—such as the hills and other highlands of western north China—and gives an exaggerated impression of its own depth. In places to the west of the Yellow River this capping of loess attains a thickness of 200 to 300 feet. In origin, this material is associated with the out-flowing winter winds, which at times cause severe dust-storms usually lasting two or three days. Strong winds blowing out from the Mongolian anticyclonic center sometimes carry such vast quantities of dust that the whole sky becomes dusky. The dry winter conditions further facilitate the movement of dust and its deposition in the provinces of north China, whereas the precipitation of summer associated with the weaker monsoon of that season helps to keep the loess in place once it has been deposited. At least, climatic conditions do not favor the blowing of this loess back into Mongolia during the summer half-year.

As related to human activities, the loess is quite noteworthy. In it many people in north China excavate their dwelling places. Its surface constitutes crop land; and over it roads of travel follow tortuous courses, extending in places as deep grooves in this loose material. Washed from the slopes, the loess finds its way into the Hwang Ho, or Yellow River, giving the yellowish color and the name to this river as well as to the adjacent sea (Yellow Sea).

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[5] Barbour, G. B.: "The Loess Problem of China," *Geological Magazine*, Vol. 67, No. 796 (1930), p. 463.

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CHAPTER V

Population and Occupation

Asia's share of the world's population.—The population of the earth is estimated at approximately 2,000,000,000. The resulting average density for the entire earth is consequently about 39 inhabitants per square mile. Of this total population approximately 950,000,000 live in Asia, giving this continent a density of 56 people per square mile. Asia is therefore conspicuous as a home for man, and there must be basic or fundamental factors which account for the development of such large human agglomerations. Some of these basic factors are geographic, others are non-geographic. Indeed, physical, economic, and historical factors all have played their part.

Distribution of population.—This large population is concentrated chiefly in the southeastern part of Asia—in India, China, and the off-shore islands. In fact, India, China, and Japan together have within their borders approximately one-half of the world's people. In this part of the continent are found a benign climate, large areas of fertile soil, and an abundant food supply. On the other hand, Asia contains vast stretches of sparsely populated land. As the accompanying map indicates (Fig. 14), large areas of Siberia, Mongolia, Eastern Turkestan, and Tibet have less than two inhabitants per square mile. Much of this interior of Asia is handicapped by dryness, poor transportation, excessive heat in summer, and cold in winter.

Although parts of Asia are still sparsely peopled, they are being encroached upon from various directions. They are more and more being limited to such undesirable places as high mountains, deserts, swamps, and tundra waste. From the west, Russians are migrating into the forests of Siberia, arid Russian Turkestan, and the adjacent semi-arid lands. The Chinese are

migrating in large numbers into Mongolia and Manchukuo. Agricultural Chinese are pressing into the land of the nomad in Mongolia, and the Chinese Government has established special offices in the cities of Kalgan and Suiyuan for the colonization districts of Inner Mongolia, Chahar, and Suiyuan.[1] The colonization of Manchukuo by the Chinese has been proceeding with almost unparalleled rapidity. The movement

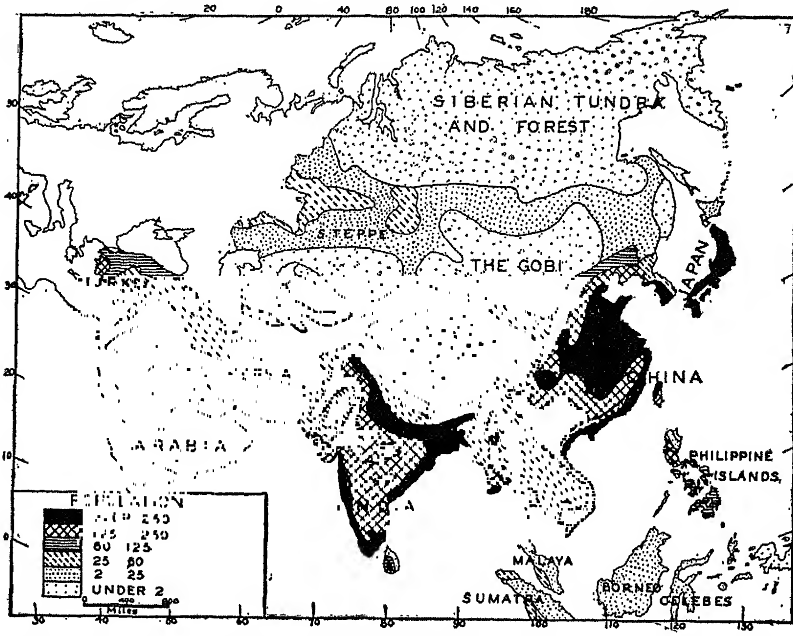

Fig. 14.—Population densities in various parts of Asia. Note the concentrations in India, China, and Japan.

began on a considerable scale toward the end of the nineteenth century, when the Manchu Dynasty, in fear of Russia, at last abandoned the short-sighted policy of trying to maintain Manchuria as a reserve for its own people and withdrew the restrictions on Chinese immigration. Later the rapid economic development of South Manchukuo under Japanese auspices, and more recently the greater opportunity which Manchukuo has offered the Chinese—especially those living in the densely

[1] Wilm, P.: "The Agricultural Methods of Chinese Colonists in Mongolia," *Chinese Economic Journal* (Dec., 1927), p. 1023.

populated, famine-stricken areas of north China—have set in motion a mass migration of accelerating magnitude. Coming mainly from north China, the migration since 1927 has averaged more than one million persons a year. What until a few years ago was mainly a seasonal migration of male laborers has now become a permanent migration of families. The growth of Manchukuo's population has therefore been very marked since the beginning of the twentieth century. In 1900 the population was approximately 14,000,000, of whom 80 per cent were Chinese, whereas at the present time the country contains about 32,000,000 people, more than 90 per cent of whom are Chinese.[2]

The development of the large population of Asia.—It is believed that the civilizations of China and India have a common origin or root. The inhabitants of both countries are descendants of people who were engaged in agriculture in the interior of Asia — along the foothills of mountains where streams furnished water for irrigation. Here the regulation of the water supply for the systematic tillage of crops helped the inhabitants to concentrate and to form groups. Thus, when man evolved from the more precarious stages of nomad hunter or pastoral nomad to the sedentary occupation of irrigation agriculture, he received the additional benefits derived from coöperative work, since irrigation calls for coöperation on the part of the various inhabitants living within the irrigated district.

Irrigation agriculture in inner Asia, however, was confined to narrow fringes along the mountains, and this land was utilized to its upper limit. Overpopulation followed, and people migrated from these restricted areas southward onto the plains of India and eastward into the fertile valleys of China.[3]

[2] Roxby, P. M.: "Expansion of China," *The Scottish Geographical Magazine* (March, 15, 1930), p. 79.

[3] According to C. W. Bishop, the present Chinese civilization carries back to a period between 2500 and 3000 B.C., when agricultural peoples from inner Asia settled in the basin of the Wei Ho, a tributary of the Hwang Ho. It was here, in the basin of the Wei Ho, that the old Bronze Age civilization of China received its definite form and finally pushed eastward to displace the Neolithic barbarian hunters and fishers. Bishop, C. W.: "The Geographical Factors in the Development of Chinese Civilization," *Geographical Review*, Vol. XII, p. 20.

In these larger areas of the Indo-Gangetic Plain of India and the valleys of the Hwang-Ho, Yangtze, and Si in China, irrigation agriculture found space for considerable expansion. Here these early settlers found not only ample space for development, but also level land and soils made fertile by the overflow of large rivers. Moreover, the long growing season—lasting the year round in the plains of India, Indo-China, and the Si Kiang—enabled the production of more than one crop a year.

Similarly, in the adjacent archipelagos environmental conditions favored the development of large populations, as manifest in the Japanese Islands, Java, and the Philippines. Many of these island peoples reflect in their culture, religion, and racial characteristics the influence of the mainland. Thus, Japan borrowed freely from Korea and China just as the British Isles at the opposite extremity of Eurasia borrowed from Europe.[4] Hindus early brought to the little island of Java their rice culture and the elements of a superior civilization.

Population and the monsoon.—In this southeastern part of Asia, populations have developed under the influence largely of one major cause—that of the monsoon. Under this climatic regime rain comes with the summer monsoon and relatively dry conditions are experienced during the monsoon of winter. Thus, rain falls chiefly at the time of greatest heat and plant growth. This condition in itself was an aid to human progress, in that people were forced to store food for the season of dearth. But in most parts of southeastern Asia the temperatures of winter do not prohibit crop production. The chief problem was that of obtaining water during the winter half-year. In many places water could be supplied by means of irrigation, and this gave rise to the year-round growth of crops. Mention is made in the Indian Census of kharif (summer) and rabi (winter) crops. In south China three crops are often obtained on the same land in the course of a year, and under a

[4] Semple, Ellen Churchill: "Influences of Geographical Conditions Upon Japanese Agriculture," *Geographical Journal,* Vol. XL, p. 589.

system of multiple cropping as many as seven have been recorded. Even in Japan and Korea the farmer grows rice, corn, and grain sorghums in summer, and barley and wheat in winter.

Population and agriculture.—Most of the inhabitants of Asia are engaged in agriculture, which is the dominant activity and the chief source of wealth. Approximately 80 per cent of the population in China, 72 per cent in India, 60 per cent in Japan, more than 90 per cent in Java, and 82 per cent in Korea are supported by agriculture. Similarly, throughout vast stretches of interior Asia, agriculture is the chief occupation of the inhabitants. Perhaps at least 70 per cent of all the people of Asia are engaged in agriculture, and the agricultural population of that continent is at least four times as large as the total population of North America. This is in striking contrast with conditions in the United States, where nearly half of the people are directly engaged in manufacture and commerce.

Largest amount of cropped land.—Asia contains not only a larger agricultural population than any other continent, but also more cropped land. According to recent estimates, the crop acreage in Asia covers more than 800,000,000 acres,[5] or more than twice the amount of cropped land in North America. A study of the crop land and population of the various continents discloses an interesting correlation (Fig. 4), the cropped land varying directly with population.

Intensive character of agriculture.—Most of Asia's cultivated land is located in the densely populated regions, and there agriculture is intensive rather than extensive in character. Reference is often made to the "spade farming" of the Orient. The little farms of Japan average only 2.5 acres in size, while in China they contain 3.5 acres of crop land. In India six people must obtain a living from approximately four acres of cultivated land. In these densely populated parts of Asia labor is cheap, fields are small, and modern machinery is generally lacking. Moreover, it is difficult to introduce better

[5] Taylor, Griffith: "Agricultural Regions of Australia," *Economic Geography*, Volume VI (April, 1930), p. 109.

mechanical equipment owing to the very low purchasing power of these agricultural people, and large labor-saving machines could not be used on these small tracts of land.

Not all parts of Asia, however, are intensively cultivated. In the more sparsely peopled areas of Manchukuo and in semi-arid Mongolia, hardy cereals such as spring wheat, barley, and oats are produced extensively and modern large-scale machinery is being introduced. Similarly, in semi-arid Siberia the Russian farmer grows wheat, oats, millet, and other grains in much the same manner as they are produced in the great plains of the United States. This difference in type of agricultural adjustment from place to place in Asia is due chiefly to diversity in the natural environment.

Crop combinations.—It is for the production of food that most of the agricultural lands of Asia are utilized, cash crops being of secondary importance. Thus, in central China a crop combination may include some land in tea and cotton, but the greater part of the cultivated area is given to rice, wheat, millet, and beans. There may be a winter crop of wheat, barley, or Windsor beans, which is followed in summer by rice and cotton. In north China a crop of kaoliang (a grain sorghum) and soy beans is sown in summer and followed in winter by wheat or barley. In some parts of the Deccan Plateau of India fields may be devoted to grain sorghums and millets (jowar, bajra, and ragi) in summer and to wheat and grain in winter.

A system of multiple cropping is also widely practiced in these densely peopled areas of the Orient. This system is the rule throughout China, wherever the climate permits. The general practice of planting crops in rows facilitates the system of multiple cropping. In southern China, where the growing season continues through the year, a certain field may contain winter wheat near maturity, a crop of beans about half grown, and cotton just planted.

Rice, a major crop in densely populated regions of Asia.—The food supply constitutes one of the closest ties between man and his environment, and in this respect rice is noteworthy. Rice is a crop that in all probability was originally

gathered in the wild state in the lake-like depressions left by periodic floods of the great rivers of India,[6] where even at present it is found in the native state. It accounts for at least one-fourth of the food requirements of the peoples of the Orient. It is the chief crop of India, Burma, southern China, Indo-China, Siam, Japan, Java, and the Philippines. In Siam about 90 per cent of the cultivated land is in rice, and in some

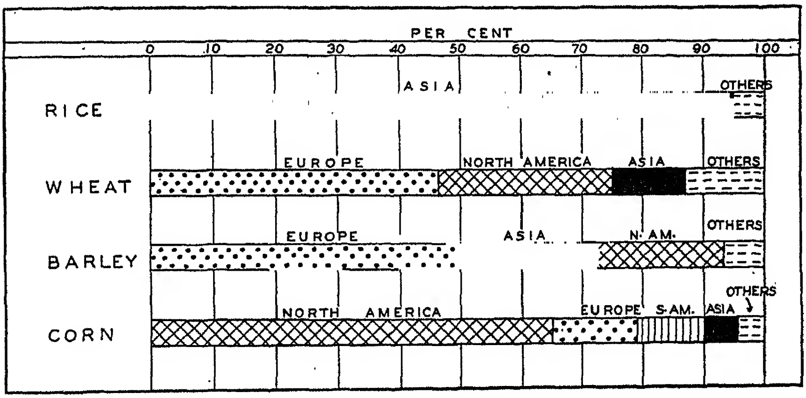

Fig. 15.—Percentage of world's production of major cereals, by continents.

of the southern provinces of China more than 70 per cent of the cultivated land is given to that cereal.

The average per capita consumption of rice by the inhabitants of these countries is more than 200 pounds annually, and amounts to 400 pounds per annum in Siam, as compared with less than ten pounds per annum in the United States. Rice is indeed considered so important by people in the Orient that the time of planting and harvesting the seed is in many countries an occasion for religious ceremonies, holidays, and festivities. It is so essential to the lives of the teeming millions of China that laws have been made forbidding the exportation of this cereal.

As a producer of rice, Asia holds a prominent place (Fig. 15). Of the total world production, more than 95 per cent is grown in Asia. Such importance of rice is due not only to the strong

[6] La Blache, Vidal de: *Principles of Human Geography*, Henry Holt and Co., New York, 1926, p. 228.

demand for it, but also to the combination of environmental factors favoring production. It is imperative that the people grow food which will give a high yield per unit of ground; and in many parts of southeastern Asia rice yields amount to twice as much as other grains. In India, for example, the average annual yield of rice during the period 1927-1931 was 29.1 bushels per acre, whereas the yields of wheat and barley were 10.6 and 14.1 bushels per acre respectively. Moreover, rice is nourishing and easily cultivated in regions where the labor is abundant and cheap.

In most of the rice growing regions of Asia the methods of cultivation are extraordinarily primitive. In preparing the ground, the average farmer uses crudely made plows which scratch the earth to a depth of but a few inches. As a rule women and children, standing in water and mud, set out the plants. They also go over every acre of rice several times between transplanting and harvest, pulling out the weeds, which are then pushed down into the mud to become food for the growing cereal. Threshing and husking also are performed in a primitive manner. Grain is threshed either by beating it on a board or a log of wood placed on a large cloth so as to catch the beaten-out grain, or by having oxen tramp on it.

Sorghums and millets.—The grain sorghums and millets play a very important part in the agriculture of the densely populated parts of Asia. In the United States such grains are used chiefly as feed for stock, whereas in Asia they are used largely as a food for man. For this latter purpose, however, they are not considered as palatable as rice and yield less abundant returns in the humid coastal lowlands and irrigated river valleys of southeastern Asia. But the sorghums have an important place in the cropping system in the higher and drier interiors. Thus the grain sorghums—jowar, bajra, and ragi—occupy more land than any other cultivated crop in the Deccan Plateau of India. In China proper the grain sorghums and millets occupy approximately one-fourth of the cultivated area, with the major production in the northern provinces (Chihli, Shantung, Honan), where the climate is unfavorable

for the production of rice. Here the grain sorghum called kaoliang is widely grown, and to the farmer of north China this plant means food, forage, building material, and fuel (see pages 469-470). Even in the semi-arid parts of Mongolia and Siberia where agriculture has been developed, sorghums and millets are important crops.[7]

Asia's position in wheat production.—Wheat, like the sorghums and millets, replaces rice in the northern regions of China, India, Japan, and in semi-arid Siberia. In recent years India has been among the six leading wheat-producing nations, with an output of approximately 300,000,000 bushels, or about twice the amount produced in Australia in one year. Although accurate statistical information is lacking, the wheat area in China may be estimated with reasonable accuracy at about 37,000,000 acres, which at the moderate figure of ten bushels per acre gives 370,000,000 bushels—thereby placing China among the leading producers of this cereal. Other estimates place the Chinese wheat production as high as 800,000,000 bushels annually. The wheat acreage is increasing rapidly in semi-arid districts of Mongolia, and a large part of the Russian wheat crop is at present produced in semi-arid regions of Siberia.

Beans and peas—the pulses.—Rice and various other grains are deficient in protein and fat; and consequently in order to balance the Orientals' rations, beans, peas, and other legumes are grown in large quantities. This practice is further favored by reason of the fact that most Asiatics are not meat-eating people. In densely populated districts livestock would consume too much of the home produce, leaving but little for human consumption on these small farms. The legumes contain considerable protein and therefore fill the place in the diet which meat holds with people in the New World and western Europe.

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[7] Wilm, P.: "The Agricultural Methods of Chinese Colonists in Mongolia," *Chinese Economic Journal* (Dec., 1927), pp. 1023-43. See also Tulaikov, N. M.: "Agriculture in the Dry Region of the U.S.S.R.," *Economic Journal* (Jan., 1930), pp. 54-80.

In the farming system, legumes often are raised on ground which otherwise would lie idle. Centuries of practice have taught these people that the culture and use of leguminous crops are essential to enduring fertility. With the purpose of fertilizing the soil, legumes may be grown in rotation with other crops. A common practice of increasing soil fertility in central and southern China consists of stacking the legume along the irrigation canals where it is saturated with mud dipped from the canals, after which it is applied to the fields.

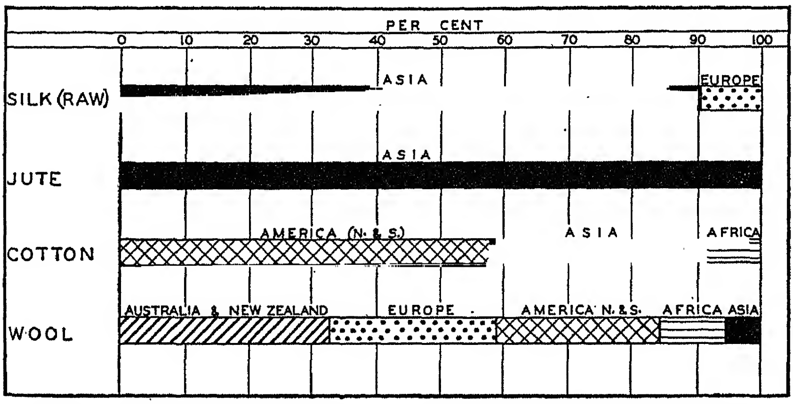

Fig. 16.—Percentage of world's production of some important fibers, by continents.

Of all legumes grown in Asia, the soy bean is commercially the most important. In the production of this crop Manchukuo holds a unique place among the political divisions of Asia and of the world; indeed, it is sometimes called "the Soy Bean Empire." The crop is also widely grown in China proper. From these parts of the Far East the soy bean has been introduced into the United States, where it is assuming a position of increasing importance in the cropping systems, especially in the humid eastern parts of the country.

Asia's position in cotton production.—Ranking second among the various continents, Asia produces approximately one-third of the world's cotton and contains three of the five leading cotton-producing countries of the world (Fig. 16). For many years India and China have held second and third place,

respectively, among producing nations and Asiatic Russia has made marked progress as a cotton grower during the last decade.

The cotton crop of Asia is confined almost exclusively to four types of climate: (1) desert; (2) semi-arid; (3) tropical (low latitude) wet and dry; and (4) humid subtropical regions. The production in the desert, such as in Russian Turkestan, is entirely by means of irrigation. Similarly, in the semi-arid and arid parts of northwest India irrigation is widely practiced. India's most important cotton-producing region, however, comprises the west-central part of the Deccan, an area with a low latitude wet and dry climate and black (regur) soils. In China, cotton is grown mainly in the humid subtropical Yangtze Kiang Basin, a region which is climatically a counterpart of the Cotton Belt of the United States.

In general, the cotton produced in Asia is of relatively low-grade and possesses a short fiber which is not suitable for fine spinning. In India, for example, three-fourths of the cotton is of a staple less than seven-eighths of an inch. Although we lack official or reliable records of China's production, all general observations disclose the fact the short-staple varieties predominate. There are various reasons for this adherence to short-staple cotton. (1) In many areas, especially in the more humid tropical districts where two crops are produced on the same land, cotton may follow in rotation after a small grain or beans. Long-staple varieties, which require a longer period of growth, would consequently interfere with this system of agriculture. The necessity of obtaining two crops a year has resulted from the pressure of population upon the land. (2) In some areas the season of cotton growth is limited not by frost-free period, but rather by the narrowly limited period of monsoon rainfall. This is especially true in the Deccan of India, where rugged relief is a further disadvantage, since irrigation cannot be extended to all parts of the region. Under such conditions some of the native short-staple cottons have been found most satisfactory. (3) In China the important cotton-producing Lower Yangtze region is handicapped by

high humidity and considerable destruction by fungus diseases. The fact that the bolls of the longer staple American cotton turn upward, unlike the pendent Chinese bolls, renders them more liable to such destruction. (4) In most Asiatic countries the purchasing power is low; and consequent relatively coarse, cheap cotton cloth is in greater demand than the finer, more expensive textiles made from long-staple cotton.

Hard fibers.—In the production of hard fibers, Asia's position among the major land masses is more distinctive than it is in the output of cotton. More than 90 per cent of the jute production of the world is concentrated in the Lower Ganges-Brahmaputra region of India, and the Manila hemp of commerce is obtained from the abaca plant of the Island of Mindanao in the Philippines. In addition, other hard fibers—such as rhea, ramie, and China grass—add to the storehouse of useful hard-fiber plants. These are used in the making of ropes, lines, and canvas; and the plants may be cultivated extensively in tropical monsoonal lands, yielding an abundance of fiber. Yet future development is retarded because of the difficulty experienced in separating the fiber from the parent stalks. Decorticators have been invented to do the work, but these have not proved successful. Where labor is abundant and cheap, as in China, the fiber is removed by hand.

Position of Asia in tea production.—Native to the hill lands and mountains of monsoonal Asia, the tea plant finds favorable conditions of natural environment along the southern and eastern margins of the continent, where almost the entire tea crop of the commercial world is produced today. This concentration of commercial tea production in the monsoonal lands of Asia is due to: (1) the favorable conditions of the natural environment; (2) the fact that tea is indigenous to this part of the world; and (3) the abundance of cheap labor. The last factor is of primary consideration in giving the Orient a comparative advantage in the production of tea over other parts of the commercial world.[8]

[8] Trewartha, Glenn T.: "The Tea Crop," *The Journal of Geography*, Vol. XXVIII (1928), p. 1.

Other important products.—Asia is distinctive also in supplying the commercial world with rubber, sugar, tobacco, cinchona, camphor, and coconuts. The rubber industry, which began with the exploitation of the native rubber plants (Hevea braziliensis) in the Amazon Basin, has shifted to the Orient, where it is at present a plantation enterprise in the rain forest areas. The Malay States and the Dutch Indies together produce approximately 90 per cent of the world's

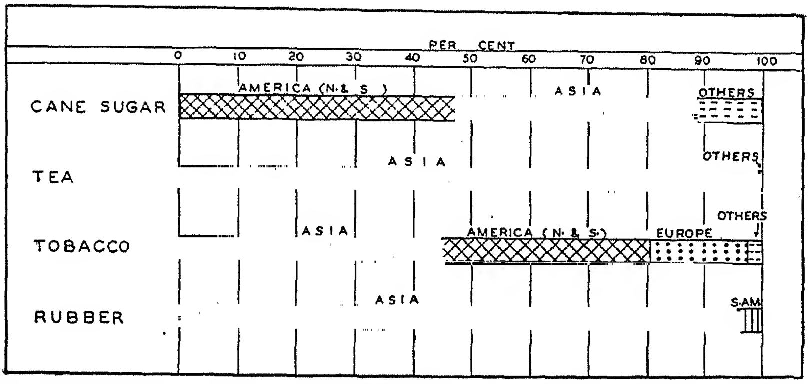

Fig. 17.—Percentage of world's production of some important commercial products, by continents.

total amount (Fig. 17). The relationship of the plantation rubber industry to population is significant, since an abundance of cheap labor is required. A more detailed analysis of this industry will be found in following chapters. The sugar cane industry of Asia is confined chiefly to regions which have a tropical wet and dry climate. Here India, Java, Formosa, and the Philippines are major producers (Fig. 17). The soap industry of the commercial world is dependent mainly upon Asiatic countries for its coconut oil, and Formosa is the world's major contributor of natural camphor (Fig. 18). The cinchona production, formerly confined chiefly to Peru, South America, has shifted to the East Indies, where Java is the leading producer.

Grazing industries and sparsely populated grasslands.—As indicated in Chapter IV, the major part of central and southwestern Asia is classified as desert and steppe. These

areas furnish grasses for flocks and herds, and pastoral nomadism is the most widespread occupation. The interior dry highlands of Asia constitute the original home of sheep and goats; and southwestern Asia has long been noteworthy for its development of beasts of burden, such as horses and camels. No less than three kinds of horse-like animals haunt the Asiatic steppe—the tarpan or wild horse, Prejevalski's horse, and the kiang or wild ass.[9] Camels have long been used as

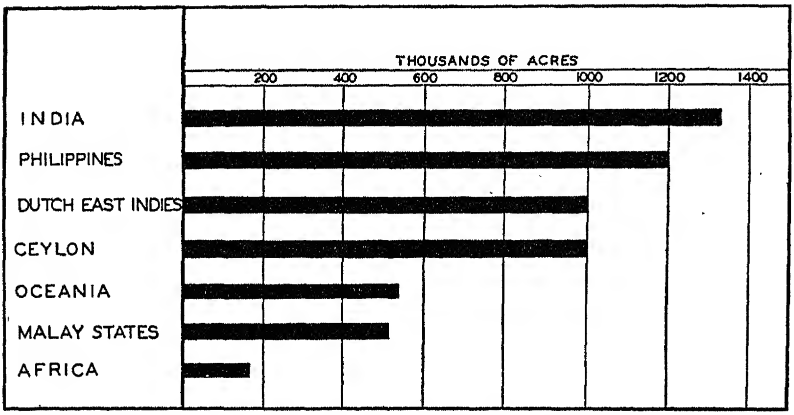

Fig. 18.—Major producers of coconuts. (Based on data from Food Research Institute of Stanford University.)

beasts of burden in arid southwestern Asia, and Arabia is at present the leading camel-breeding country in the world, possessing in a normal year approximately 750,000 of these animals. The fastest camels—those used chiefly for riding purposes—come from central Arabia and the interior districts of Oman and Aden. Cattle are also important in the Asiatic grasslands, especially in the better watered steppe regions of Russia, Mongolia, and India. It is generally not recognized that India has more cattle than any other country; and cattle may be traced back in their origin to the general region along the southern slopes or foothill regions of the Himalayas. The physiological structure of the jaws and teeth of cattle is such as to lead the students of animal geography to suspect that

[9] Newbigin, M. I.: *Animal Geography,* The Clarendon Press, Oxford, 1913, pp. 59, 60.

cattle have grazed for countless ages on plentiful soft-fibered vegetation, in contrast with sheep, which in their native home feed upon dry hard-fibered types of vegetation.[10]

Unlike the fertile well-watered lowlands of the Orient, these semi-arid and desert areas are relatively sparsely populated. Many of these areas have scant resources, and thus mankind finds life difficult. The commerce is relatively small in such places, and they may indeed be called lands of limited opportunity.

Hunting in sparsely populated frontier regions.—As the most primitive of human occupations, hunting still is a major means of livelihood in sparsely populated forests and tundra, especially in many parts of those frontier areas in which man lives close to nature. The best furs are obtained from the northern forested regions, where the native animals find food and where the rigorous climate calls for relatively heavy pelts. Thus, Siberia, which contains the coniferous forest, is one of the world's important sources of furs, and hunting is of considerable economic importance over large divisions of the country. In some localities it is the chief means of livelihood, while in others it supplements fishing and farming. From these forests come the furs of squirrel, sable, hare, fox, marten, ermine, and bear, which are sent in large quantities to western Europe and to the United States.

Timber industries.—Asia contains some of the most extensive forested areas of the world. These occur mainly in the north, east, and south, the vast dry central and southwestern parts of the continent having scant timber resources. However, the forests are exploited on a very small scale; and consequently relatively few people are employed in the timber industries. Even the northern coniferous forest—the most extensive in the world—is essentially a virgin wilderness which is awaiting more adequate transportation facilities. Here the Siberian forests are found in broken tracts, intersected by innumerable streams whose valleys consist of marshes or

[10] Mathew, W. D.: "Climate and Evolution," *Annals of the New York Academy of Science,* Vol. XXIV, pp. 171-318.

meadows. The interstream areas contain important species, such as, the pine, larch, Siberian fir, spruce, and cedar—trees which suggest a promising field for future commercial activity, not only for logging, but also for the establishment of those industrial enterprises which use wood as their raw material.

In Japan and China forests have long been exploited, and in the fertile valleys they have been cleared in order that the land may be used for farming. The development of forest industries is especially noteworthy in Japan, with its large-scale production of pulp, paper, and matches. The better timber is obtained from the northern parts of the archipelago and from Manchukuo. In China forests have been cleared from most of the accessible areas, and the remaining stands are found mainly in rugged highland regions of the south and in Manchukuo, where they await better transportation facilities before exploitation becomes profitable. But there are large areas of land in China where the native vegetation consists of grassland rather than forest.

In southern and southeastern Asia tropical monsoon forests contain important commercial species, some of which enter the arteries of trade. But there are vast regions containing virgin stands of timber—regions which may become promising fields of commercial activity. At present only a relatively small percentage of people is engaged in forest exploitation, although some of the products, such as teak, occupy a distinctive place in the world trade of some districts. Thus, in Siam teak normally ranks second among the exports of the entire country.

Mineral exploitation.—Although Asia contains a variety of mineral resources, its mineral wealth is but little utilized. On the basis of area, the continent is far from being as richly endowed with basic minerals as are North America and Europe; and only a small percentage of the population is occupied in the exploitation of these subsurface deposits. Its largest iron ore reserves are confined chiefly to India, Manchukuo, China proper, and Asiatic Russia; but these are greatly surpassed in amount and in accessibility by both the

Lake Superior ores of the United States and the Lorraine deposits of France. In general, the iron-ore reserves of the Orient are scattered and do not warrant the development of many separate metallurgical industries. In various areas the development of any large iron and steel industry is seriously handicapped. Thus, in China, (1) excessive cost of coke, (2) general lack of organization and efficacy in operation, (3) limited domestic market, and (4) generally disturbed political

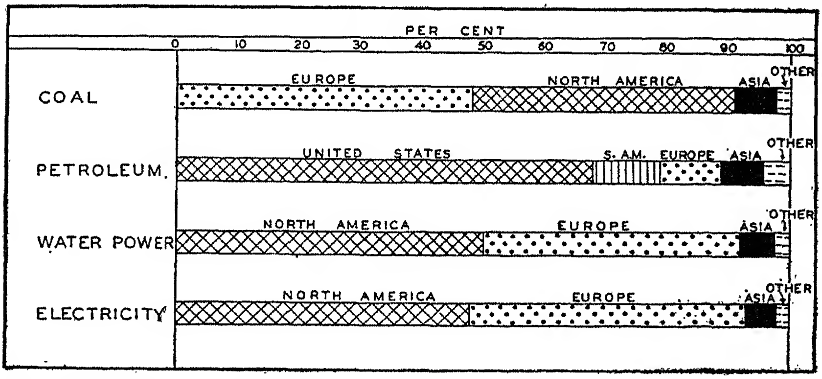

Fig. 19.—Percentage of world's total production of sources of power, by major land masses.

conditions militate against such development. In Japan—the largest consumer of pig iron and steel in the Orient—the requirements for complete independence from foreign iron and steel imports is a local production of approximately 2,750,000 tons per annum; and the production of iron and steel in Japan at this maximum limit would not be economical by reason of the high cost of coke.

The distinctive producer of coal in the Orient is Japan, where a combination of factors—such as, favorable location, increasing industrial development, and a large trade—favor production. Although the coal reserves of India and China are large, exploitation is narrowly limited.

While Asia adds but little to the total amounts of coal and iron ore of the commercial world, it does contribute large percentages of the world's tin, antimony, tungsten, graphite, and emery (Fig. 19).

The fisheries.—The importance of the fisheries in various parts of Asia is commonly underestimated. The fact is that fishing is one of the most important of human occupations in many parts of the Orient, and millions of people are engaged either directly or indirectly in this activity. The fisheries of Japan are among the most productive in the world. They employ approximately 1,500,000 fishermen and yield an abundance of food. Here the most powerful gravitative force exerted by the sea upon primitive man was probably that of its fishing grounds, especially where cold and warm currents come in contact—the cold Okhotsk and the warm Kuro Siwo. In early times the fisheries of Japan presupposed a relatively settled population, and attracted to the coasts great numbers of skilled fishermen living on raw fish and rice—facts which account for the precocious density of population in the archipelago.[11] The coastal fisheries of southern China may also have been the principal reason for the early high density in that region. Even in the tropical waters adjacent to peninsular Indo-China the fisheries are significant not only as a supplement locally to the otherwise unbalanced diet of rice, but also as an item of export. Thus, along the Burmese coasts of Arakan and Tenasserim, along the shores of the Gulf of Siam, and in the off-shore waters of Cochin China and Annam of French Indo-China the fisheries are noteworthy. In Tonlé Sap, a lake of Cambodia, this resource is eagerly sought. The pearl fisheries along the eastern coast of Arabia and in the off-shore waters of Ceylon add to the importance of the fisheries of Asia. In many parts of northern Siberia fishing and hunting are the chief occupations.

Manufacturing as an occupation in Asia.—In only a few districts of Asia has modern manufacturing become a matter of importance, and the great majority of the people are still occupied in agriculture. Yet cottage and workshop industries employ many workers, and it is not correct to speak of the

[11] La Blache, P. Vidal de: *Principles of Human Geography,* Henry Holt and Co., New York, 1926, p. 232.

continent as agricultural in the sense that one might describe farming communities that are concerned only with agricultural production. Smoking chimneys and great factories are few and are found mainly in the larger cities of Old Japan, China proper, and India. In these areas the factory system is concentrated chiefly upon the making of textiles, especially from cotton, since cotton goods are in great demand in these densely populated tropical and semi-tropical lands of the world. More widespread are the cottage and workshop industries; and Oriental countries may boast of millions of hand looms which are an important agency contributing to the means of livelihood of the agriculturists.

The West and the East contrast strikingly in matters of industrialism. While the West has forged ahead with rapid strides—especially western Europe and eastern United States—the East still retains its handicraft industry as the most important and widespread system of manufacturing. Even Japan, which is sometimes called the "Britain of the Orient," is as yet predominantly agricultural and employs only about 2,000,000 factory workers. The present low status of the modern factory system in various parts of Asia is due to a number of factors. (1) In many regions handicrafts survive mainly because they are located in areas that are remote from industrial centers and mechanical transport. As lines of modern transportation spread, the spheres of handicraftsmen tend to narrow. The relatively poor transportation facilities in large divisions of Asia may be seen, for example, in China—a country which possesses three to four times as many people as the United States but only about one twenty-fifth the railway mileage found in our country. (2) In many parts of the continent agriculture is traditionally the most desirable occupation for the great masses; and agriculturists are extremely reluctant to take up industrial life in the towns or in rural factories, even when they can increase their earnings.[12] (3)

[12] Anstey, Vera: *The Economic Development of India,* Longmans, Green and Co., London, 1929, p. 228.

Unsettled political conditions, especially in the Far East, constitute an additional obstacle to industrial development. (4) By reason of the pressure of population upon resources, the purchasing power of millions of Asiatics is low; and their consumption of factory-made goods is narrowly limited in amount and in variety. (5) Some Asiatic countries were latecomers among the nations of the commercial world. The West is favored by the momentum due to an early start in the application of science to industry. With the mechanical devices of modern scientific society, it is estimated that in the United States each person has at his or her command the equivalent of fifty to sixty mechanical slaves, whereas in China there is but one per capita.[13] Japan is the most advanced of the Asiatic countries from the standpoint of utilization of power resources; and there also modern industry has reached a higher stage of development than in other parts of the Orient. (6) The social structure of the peoples living in leading Asiatic countries has further retarded modern industrial progress. With great masses of illiterate people, well-trained and skilled workers are lacking in many industries. In China the family rather than the individual is the working industrial basis, making it difficult for members of several families to join in an enterprise that is larger than the family unit can handle. One family suspects that the other will take an unjustifiable share of the profits. Such suspicion is ruinous to business. The individual, with his moral characteristics and honesty, is of little consequence in affecting this situation. Social code is the chief consideration, and in this respect the family as a social institution comes first.[14] In India there is the caste system with all its evils. A person is born into a certain caste, and therefore remains in a certain occupation in spite of the fact that he may possess better native ability for some other type of work.

[13] Arnold, Julean: "Modern Industry in China," *Chinese Economic Journal*, Vol. VII (1930), p. 1069.

[14] James, H. F.: "Industrial China," *Economic Geography*, Vol. V (1929), p. 5

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Part II

SOUTHWESTERN ASIA

CHAPTER VI

Southwestern Asia—Turkey

Center of the Mohammedan world.—Southwestern Asia is the heart of the vast Mohammedan world. It contains Mecca, the sacred city of Mohammedans and the birthplace of Mohammed. In the Arabian part of this vast realm, Mohammed brought together quarreling Arabian tribes and persuaded them to extend Moslem authority against a non-Moslem world. Thus, through authority and force, Mohammedanism has spread eastward from the Arabian Peninsula into India and even into various parts of the East Indies, western China, and Malaya; northward into Russian Turkestan; and westward through northern Africa.

Population distribution and density.—Southwestern Asia is one of the most sparsely populated divisions of the continent. As treated in this text, the division consists chiefly of Anatolia, Arabia, Persia, Iraq, Palestine, Afghanistan, and Syria. With a combined area of about 2,500,000 square miles and a total population of 46,000,000, these countries embrace but little more than one-fifth the total area and one-sixth of the total population of the Mohammedan world.[1]

The sparsity of population in southwestern Asia attests an unfavorable natural environment for widespread and intensive agriculture. It reflects a condition that is common to areas where pastoral nomadism is the dominant activity. The paucity of material resources further limits the economic possibilities of the area. The densely populated parts of this division of Asia are practically confined to well-watered coastal regions, irrigated districts, and urban centers.

[1] For areal extent, population, and resources of the entire Mohammedan world, see Bowman, Isaiah: "The Mohammedan World," *Geographical Review*, Vol. XIV (1924), pp. 62-74.

Mainly a dry highland region.—This division of Asia contains a natural environment which has various distinctive features. The climate consists mainly of desert and steppe. Grasslands, therefore, constitute the chief type of vegetation. Only the coastal regions and interior windward highlands receive sufficient precipitation to support forests. Even some of the coastal sections, however, are arid and are covered with none but xerophytic types of vegetation.

A striking feature of the rainfall of the major part of this section of Asia is its distribution. In general, more rain falls during the winter than the summer half-year; and in this respect southwestern Asia stands in sharp contrast with the monsoonal lands farther east. This rainfall distribution is typical of the mediterranean type of climate, which indeed is well developed in the western coastal part of this division of Asia, especially in western Turkey.

There is an extreme range in temperatures. This range is most pronounced in the interior of the land masses, where the heating and cooling effect of the land is but little modified by the moderating influence of water. Thus, in interior Arabia, Anatolia, and Persia frosts are experienced in winter, whereas the maximum temperatures of summer exceed 100°F.

Pastoral nomadism most widespread.—The combination of highlands, dry lands, and desert and steppe vegetation suggests the development of pastoral nomadism—the most widespread economic activity and the chief source of wealth. Parts of this area are noted for their excellent breeds of horses and camels as well as sheep and goats. Sheep are most numerous for the section as a whole, goats are most densely distributed through the interior tableland of Turkey, whereas excellent camels and horses are raised in large numbers in Arabia and Persia.

Irrigation agriculture.—In general the normal rainfall is deficient for crop production; and therefore irrigation agriculture has developed in various places. Only in certain coastal regions, such as the north and west coasts of Turkey and western Syria and Palestine, are crops grown extensively without

the aid of irrigation. In Arabia, rain in appreciable quantities falls only in Asir, Yemen, the Aden Protectorate, Oman, and Hadramaut—and there only in a very narrow belt of higher land. Consequently, for the greater part of this division of Asia crop production is directly related to irrigation agriculture.

The type of irrigation agriculture that is practiced depends mainly upon the character of the topography. Where large streams flow through extensive areas of lowland—as the Tigris and Euphrates in the large valley of Mesopotamia—the water is either pumped directly onto the land or diverted into canals, to be further doled out to the agricultural areas. Elsewhere water for irrigation purposes is obtained mainly through the following sources: wadis; wells; conduits; and rain cisterns.

Irrigation agriculture has made possible the production of crops that have become commercially important. Among these are dates, figs, olives, and cotton.

Natural resources.—Southwestern Asia lacks the combination of natural resources essential to the development of large and powerful industrial nations. With the exception of petroleum, important mineral resources are either lacking or found in quantities too small for metallurgical developments. Similarly, timber resources are lacking over the greater part of the area. The soil resource is favorable, since precipitation is low and leaching of the soil particles is at a minimum. But the low precipitation prevents widespread agricultural production without the aid of irrigation. Nations developing within this vast realm of steppe and desert cannot attain industrial importance comparable to that of the nations of western Europe and the United States, chiefly because of the fact that they lack the necessary combination of natural resources that favors such development.

ASIATIC TURKEY—ANATOLIA

Significance of the country's location.—The strategic location of Turkey has been a factor of major geographical significance in the country's political, social, and economic develop-

ment. The history of this country reflects the importance of location at the junction of three continents—Asia, Europe, and Africa. In addition, Asiatic Turkey is bounded by sea on three sides, and it is therefore accessible from widely separated regions. By reason of its location it has dominated caravan traffic and intercontinental trade. It was this location which enabled the Turkish vessels to control the entrance to the Black Sea, and even to extend their influence as far as the Atlantic entrance into the Mediterranean. Because of its location, Turkey has drawn the elements of its population from diverse sources—from the grasslands of Arabia, from the highlands of Persia, from the Caspian plains of Asia, from the multifarious race stocks of the Caucasus, and from the Greek coasts of the Balkan Peninsula.[2]

In spite of its favorable location, Asiatic Turkey has not kept pace with certain parts of southeastern and eastern Asia in industrial and commercial development—mainly because of a combination of factors which have tended to retard its growth. Some of these are historical, some social, while others are geographical in character. Adherence to ancient custom and type of religion has played a prominent role. Asiatic Turkey lacks abundant and cheaply available reserves of iron ore and coal-minerals essential to any material economic development. Much of the interior of the country is desert and steppe, and the coastal areas consist mainly of very rugged topography with relatively small areas of level land. It is chiefly because of a number of environmental and non-environmental handicaps, rather than location, that Turkey is not one of the great Powers at the present time.

Physical framework of the country.—A lofty oblong central plateau comprises the greater part of Asiatic Turkey. This plateau is bordered on the south, west, and north by mountains, which in turn are flanked on their seaward side by a narrow fringe of coastal lowland. The latter is very irregular

[2] Semple, Ellen Churchill: "The Regional Geography of Turkey, A Review of Banse's Work," *Geographical Review*, Vol. XI (1921), p. 338.

and broken along the Aegean Sea (Fig. 20). The interior plateau, all of which lies above the 2,000 foot contour, increases in altitude toward the east. Its surface consists mainly of soils derived from limestone or volcanic material. The southern and northern sides of this plateau are flanked by mountain chains running roughly parallel with the coast. These descend abruptly to the north and south coast lowlands. The approach to the west coast lowlands, on the other hand,

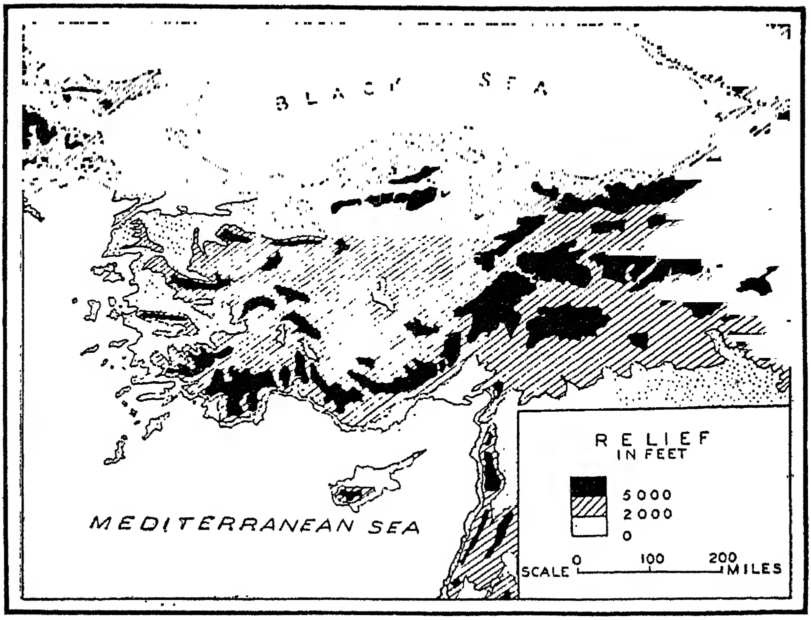

Fig. 20.—Relief of Turkey. (Altitudes according to J. Paul Goode.)

is more gradual, the mountains sloping gently down to the coast for a distance of at least a hundred miles in some places.

By reason of the east-west trending mountain system and the gradual slope of the valleys which rise eastward from the Aegean Sea, the main routes across Anatolia have always been aligned roughly from west to east. This country in fact has been a natural bridge between the Balkan Peninsula, on the one hand, and the interior of Asia on the other. Caravan routes have extended across this region and have been used

by soldiers and merchants throughout historic time. This through traffic has indeed been much more important than the local traffic between the interior plateau and the north and south coastal lowlands.

Mainly an arid and semi-arid country.—Asiatic Turkey contains three climatic regions which differ widely from one another. These are: (1) the arid and semi-arid interior plateau; (2) the Pontic region of the north coast; and (3)

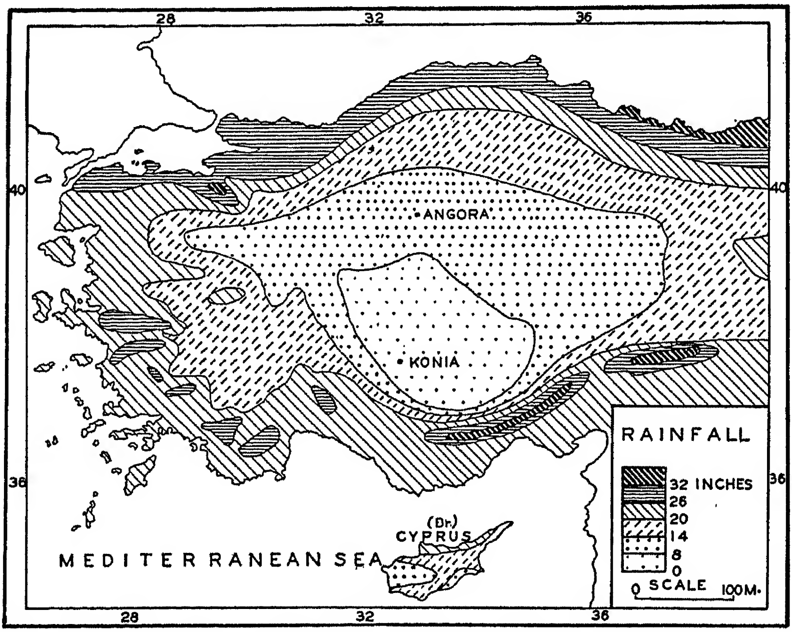

Fig. 21.—The average annual rainfall of Asiatic Turkey. (Modified after R. Fitzner.)

the Mediterranean climatic region of the south and west coasts. An arid and semi-arid climate is found over the greater part of the country (Fig. 21). The rain-bearing winds lose much of their moisture on the coastal lowlands; and therefore the vast interior plateau is generally lacking in moisture. As a result of this distribution of precipitation the chief agricultural lands are located along the coast, whereas the interior plateau is mainly a land where nomads move from place to place seeking pasturage for their livestock.

The climate of this central plateau is characterized by extremes. During the winter season snow and severe frosts are common; whereas the summers are dry, with clear skies and intensely hot days followed by cool nights. In its general climatic characteristics this plateau may be considered a counterpart of the steppe lands of Russia.

The Pontic climatic region—embracing the north coast lowlands and adjacent mountain slopes—is characterized by a

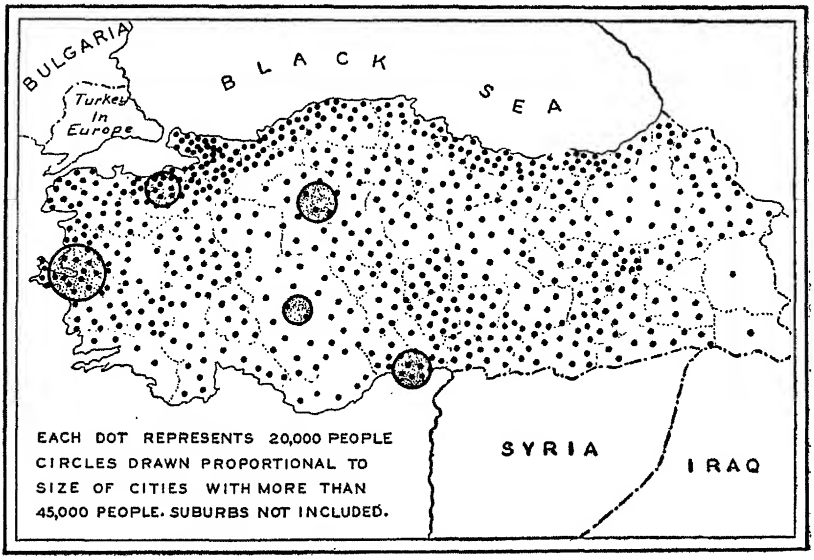

Fig. 22.—Population of Asiatic Turkey, based on recent census reports.

moderately abundant precipitation, which increases with distance eastward. For the region as a whole the average annual precipitation is more than 30 inches. In addition, it is more uniformly distributed throughout the year in this region than it is in other parts of Turkey, chiefly because of the constancy of the moist northerly winds. These blow in winter toward the Aegean Sea and in summer toward Mesopotamia.

In contrast with the climate of northern Turkey, that of the west and south coasts has a more marked seasonal distribution of precipitation, with the greater amount coming during the winter half-year. These coastal areas have from 24 to 30 inches

of precipitation a year. It is a climate with winter rain and summer drought, being typical of the mediterranean climate of which, indeed, it is a part. The climate of Smyrna and other centers located in the western lowlands of Anatolia have been compared with the Italian Riviera, the chief difference being the smaller amount of rainfall and the greater temperature range experienced in the Asiatic region.

Vegetation and soils.—Because of the small amount of precipitation and the rapid evaporation, the vegetation of the greater part of Asiatic Turkey consists of short, scattered grasses. These have given rise to the development of a nomadic form of life over most of interior Anatolia (Fig. 22). Grasslands give way to forests along the windward highland slopes, especially on the outer slopes where the rain-bearing winds from the neighboring seas have expended their moisture.

Climate and vegetation, in turn, have had a marked effect upon the development of soils. In general, soils of the interior arid and semi-arid steppe are well supplied with lime. In the numerous valleys along the coasts of the country, soils have been developed in alluvial materials, which are commonly rich in a variety of mineral ingredients and organic matter. But the coastal areas sometimes suffer from violent rainstorms and resultant erosion of the land, especially where deforestation has taken place.

Four major geographic regions.—On the basis of variety in environment as well as human adjustments thereto, Asiatic Turkey may be divided into four major geographical regions.[3] These comprise: (1) the north coastal region, which embraces the lowlands and highland slopes adjacent to the Black Sea; (2) the Turkish Mediterranean Region, which consists of the littoral of the Aegean and Mediterranean Seas; (3) the interior forested highlands; and (4) the interior grassland region of pastoral nomadism.

[3] For a description and explanation of the natural regions of Turkey see the excellent work by Banse, Ewald: *Die Turkei—Eine Moderne Geographie,* George Westermann, Brunswick, 1919. See also Semple, Ellen Churchill: "A Regional Geography of Turkey," *Geographical Review,* Vol. XI (1921). The latter is a review of Banse's work.

The north coastal region: an important tobacco-producing area.—The north coastal region comprises the relatively narrow strip of land which stretches along the Black Sea. It is flanked by the high east-west trending mountains which rise abruptly from the coastal lowlands. These mountains are broken in only a few places by transverse valleys. Cultivation is therefore confined mainly to relatively narrow belts.

Tobacco production.—Although many different types of economic production are found in this region, the production of tobacco is distinctive. Indeed, this area produces more than three-fourths of the tobacco grown in Asiatic Turkey.[4]

Tobacco is not indigenous to this region, but was introduced from America following the treaty of commerce between Turkey and the Netherlands in 1612. Consumption of tobacco in Turkey was at first prohibited, and it was not until the latter part of the seventeenth century that trade in tobacco had attained any considerable importance. At present the production of cigarette tobacco plays a prominent role in the national economy of the country and it constitutes the leading export.

Turkish tobacco has lost many of its American characteristics and gradually developed new qualities, so that it is now a distinctive type. It is smaller than the American varieties, the leaves being only three to four inches in length. But the most marked difference is in taste—the pungent, spicy aroma, distinctly different from American types. Although many prefer straight Virginia, and although most smokers today find straight Turkish cigarettes too rich and heavy, the aroma of Turkish tobacco is highly valued, as proved by the overwhelming popularity of Turkish blend cigarettes in which the aroma of Turkish is blended with the sweetness and body of American tobacco.[5]

Production as related to environment.—It is mainly because of the more abundant summer precipitation that this

[4] Approximately 95,000,000 pounds of tobacco were produced in Turkey in 1929 and 1930.

[5] Ravndahl, G. B.: *Turkey, Commercial and Industrial Handbook,* U. S. Dept. of Commerce, Washington, D. C., 1926, p. 96.

region has become the most important tobacco growing area of Turkey. In addition, relief and soils favor production. The best Turkish tobaccos grow on the slopes of the hills, near the mountains, in red clay soils.[6]

Agricultural practices as related to tobacco production.—Through planting, cultivating, and plant breeding the Turkish peasant strives to develop a tobacco leaf of high quality. He usually plants the seed in the early spring, transplants the seedlings in May, and cultivates the plants during the summer months. The crop is normally harvested from July to September, the exact time depending upon the locality and atmospheric conditions.

Unlike the method that is prevalent in America, Turkish tobacco is harvested leaf by leaf as it ripens. This work is generally performed at dawn, after the dew has moistened the leaves, so that the stems break without any appreciable injury to the leaf. Picking is limited to not more than four leaves from each plant. Grading, threading, and drying operations follow. After three to four weeks of drying, the strings of tobacco are packed into piles and covered with blankets. The latter practice is followed in curing the tobacco, which is usually done in November. Following the period of curing, the leaves are taken to market or to the owners' storage depots. Pack mules, camels, and oxcarts are all employed in transporting the commodity. Assorted, baled, and wrapped, the tobacco is left in the warehouse to age before it is released for general consumption in the markets of the world.[7]

Other crops.—Although tobacco is the most distinctive commercial crop, cereals are more widely cultivated in this region. These consist mainly of wheat, maize, barley, and millet. Wheat is widely grown in Turkey, since wheat bread is the most common article of diet. The barley, in common with that which is grown in southern Europe, is of the two-row, light-colored variety, and it is therefore not only con-

[6] *Ibid.*
[7] *Ibid.*

sumed at home but also exported to Europe where it is used for malting purposes.

The rugged west and south coastal region: Mediterranean Turkey.—Mediterranean Turkey comprises the rugged, highly articulate coasts and valleys adjacent to the Aegean and Mediterranean Seas. These areas, in contrast to the north coastal region, are characterized by a climate that has a typical Mediterranean rainfall regime—winter rain and summer drought and an abundance of sunshine throughout the year. Like other Mediterranean lands, they have become important in the production of citrus fruits, olives, and grapes. In addition, the production of cotton—a crop common to more humid lands—has become an important activity in the south coastal region, and this mainly because of irrigation agriculture, fertile soils, and the local demand for raw cotton.

The rugged west coast region and its fruit.—The many valleys extending inland from the Aegean Sea (Fig. 20) constitute the most important fruit-producing area of Asiatic Turkey. It includes the Smyrna district, a unit that has long been famous for its figs (Figs. 23 and 24). Olives, citrus fruits, and raisins are other specialized agricultural products of this area.

The olive, a typical Mediterranean product.—Although the olive is not an important commercial crop in this area, it constitutes an essential part of the diet of the inhabitants, taking the place of butter and other animal fats that are widely used by northern peoples.

The localization of olive production in Turkey is closely related to climatic conditions. The olive tree is practically excluded from the northern coastal region owing to summer rains, which are undesirable since they come at a time when the fruit is developing. The tree grows best in the Mediterranean coastal areas, especially on the plains of Troy and in the lowlands adjacent to Aidin.

In the west coastal region relief and soils are also important factors with respect to the selection of sites for olive trees,

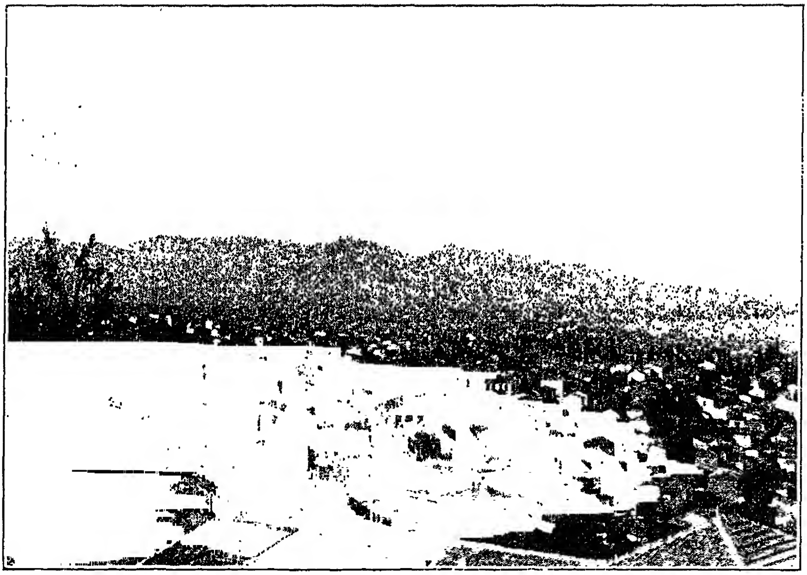

Fig. 23.—View of Smyrna Turkey. (Courtesy of Near East Foundation.)

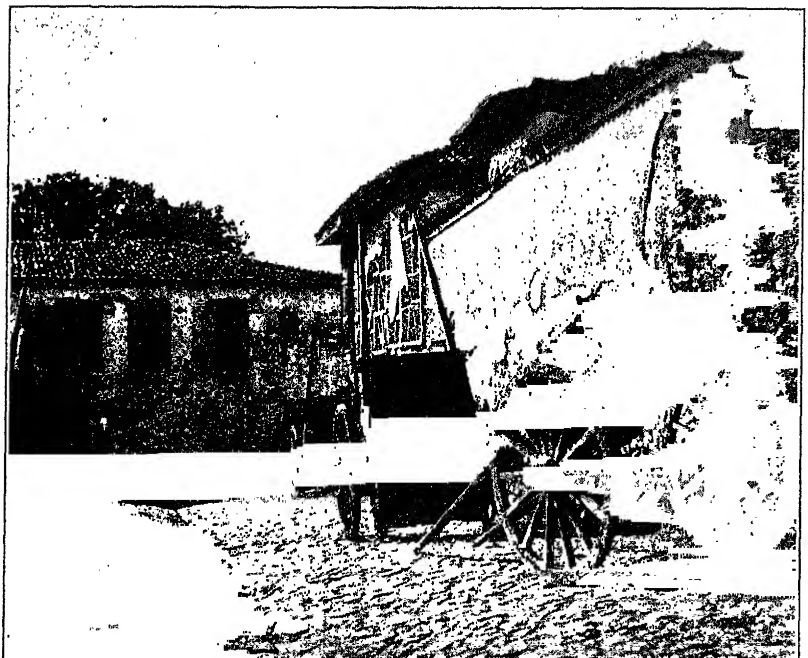

Fig. 24.—Pinar Basi, Turkey, near Smyrna. Village scene showing native carts. (Courtesy of Near East Foundation.)

which usually yield more oil when they are planted on the limey soils of lower mountain slopes than in the alluvial lowlands. Intermediate elevations are therefore chosen for the crop.

Only relatively small quantities of olives and olive oil are exported from Asiatic Turkey, mainly because of their poor quality. A common practice consists of leaving the olives in heaps on the ground until they have been assessed by the tax-collectors. They are then salted to prevent decay.[8]

The fig, a commercial product.—The production of figs in commercial quantities in Turkey is confined mainly to nine or ten small districts lying near the city of Smyrna. In fact, the Smyrna districts produce approximately two-thirds of the 30,000 tons of figs grown in Turkey. Smyrna figs of the highest quality are produced in the Menderes Valley. Here the people have been growing figs for centuries and have therefore developed a high degree of skill and technique in fig culture.

Practically the entire export trade in Turkish figs is conducted through Smyrna, whereas the city of Aidin is the principal center for the internal trade. The railway that connects these centers—Aidin Railway—carries nearly the entire commercial fig crop.

Grape production.—Although grapes are grown in many parts of Asiatic Turkey, the west coastal region is most important. Here an export trade in raisins has developed because of favorable environmental factors for raisin grape production, especially an abundance of sunshine and therefore excellent drying conditions for a part of the year at least.

Future of agriculture in the west coast areas.—Western Anatolia is a land of valleys in which irrigation agriculture constitutes the chief source of wealth. But much land still remains either swampy or arid, and therefore requires in part irrigation and in part drainage before it may be utilized for growing crops. The Smyrna district may be taken as typical. Here the area drained by rivers and their tributaries has been

[8] Merriam, G. P.: "The Regional Geography of Anatolia," *Economic Geography,* Vol. II (1926), p. 90.

estimated at approximately 10,000,000 acres. Much of this land is now under cultivation, but a large part of it is either arid or swampy. Students of irrigation and drainage believe that the whole area can be rendered cultivable by drainage and by correct control and distribution of the water that is now largely wasted; but the cost, which is placed at 88 million dollars, makes the scheme prohibitive, at least for the time being.[9]

South coastal region.—The south coastal region, like northern Anatolia, consists of relatively narrow lowlands and adjacent mountain slopes which ascend sharply to the east-west trending mountain ranges. Like western Anatolia, the climate of this region is characterized by an abundance of sunshine during the year, and with winter rain and summer drought. Here the coast ranges get more abundant precipitation than the adjacent lowlands. In the lower coastal ranges a typical mediterranean vegetation prevails, as well as abundant water to irrigate in summer the various fields and orchard crops at their base. On the upper slopes the mountains support extensive belts of forests, which vary with increasing altitude from temperate zone hardwoods to conifers.

The most important agricultural area of southern Turkey embraces the Cilician Plain. This plain is roughly crescent shaped, with the Taurus Mountains on the north and west, the Giaour-Dagh Mountains on the east, and the Gulfs of Mersina and Alexandretta on the south. It covers an area of approximately 5,000 square miles, being about 100 miles long and 50 miles wide.[10]

The area under cultivation on the Cilician Plain is estimated at 1,350 square miles, or approximately one-fourth of the total. This cultivated land is devoted mainly to the production of cotton, wheat, barley, and sesame. It is estimated that approximately 50 per cent of the total area under cultivation

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[9] Ravndahl, G. Bie: *Turkey, Commercial and Industrial Handbook,* U. S. Department of Commerce, Washington, D. C., 1926, p. 79.

[10] See the excellent article by Commercial Attaché Erwin P. Keeler: "The Cilician District of Turkey," *Commerce Reports* (October 21, 1929), Washington, D. C., pp. 141 and 142.

during normal years is devoted to cotton, 25 per cent to wheat, 10 to barley, 5 to sesame, and 10 per cent to miscellaneous crops; such as, oats, maize, and millet. Cotton not only covers a larger area than any other crop grown on this plain, but it is also the chief commercial crop. Here labor is a critical problem, many growers depending on the help of the hill tribes. These people who come out of the hills, located north of the Cilician Plain, during the spring of the year, help plant and thin the crop and then return to the hills about the first of June to harvest their wheat and barley. After planting their fall wheat in September and October, they return to the plain to pick cotton. Often the field has had no care since they left four or five months earlier. Under such conditions the yields are low. The crop is all harvested at one picking or snapping. A peculiarity of the native cotton is that its bolls do not open and that they all tend to mature at one time. The wages are as a rule paid in kind (i.e., cotton) and amount to about one-tenth of the crop. If a cash wage is paid, it is about 20 to 25 cents a day. The crop must be out by the last of October, when the winter rains start.

The average size of the farms on the Cilician Plain is larger than in any other part of Turkey. The average for the Cilician vilayets[11] of Mersina, Djebel-Bereket, and Adena is eighteen acres, as compared with an average of six acres for the entire country. These figures suggest why large, modern machinery is but little used in Turkey. In addition, the peasant farmers are generally too poor to purchase such equipment, a condition that is further aggravated by the high interest rates on agricultural loans (18 to 22 per cent).

The interior pastoral highlands.—Two major types of environmental units may be recognized in the interior of Asiatic Turkey—the well watered mountain slopes, and the arid and semi-arid plateaus.

The rain-bearing winds coming from the adjacent seas ascend the mountains and expend their moisture on the wind-

[11] A vilayet is a small political division of Turkey. There are 72 vilayets in the country.

ward slopes, leaving much of the interior arid and semi-arid. Many of the mountainous sections, therefore, contain large stands of timber, whereas the vast interior plateaus have xerophytic grasses (drought resistant) and brush. The interior drainage and salt lakes further attest the arid climate of this region.

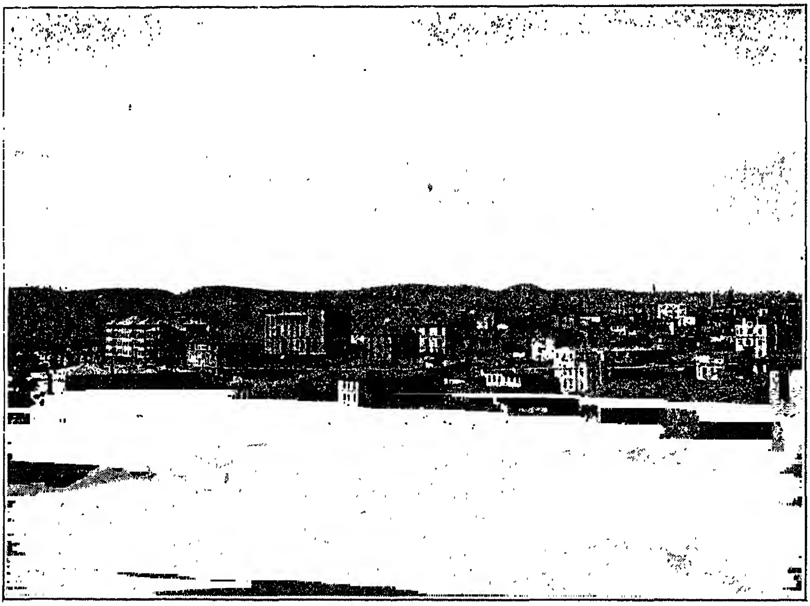

Fig. 25.—View of Angora, Turkey. (Courtesy of Near East Foundation.)

The most widespread activity of this highland is pastoral nomadism, although some irrigation projects, notably the Konia, have been developed. This region therefore possesses a large percentage of the country's 10,000,000 sheep and 7,000,000 goats.

Angora, the present capital of Turkey, is located in this interior grassland region (Fig. 25).

The forested highlands.—The forests of Asiatic Turkey are found mainly in three large areas—the northern, northwestern, and southern parts of the country. Brusa, a province located in the northwestern part of Anatolia, contains 34.9 per cent of the total forested area of the country; other important units

include the vilayets of Trebizond, Adana, and Smyrna. In all of these areas the more extensive forests are confined to the high, relatively rugged mountain slopes, which, because of their inaccessibility, have not been exploited. The more accessible highlands have suffered as a result of over-exploitation; and Turkey is a good example of a country in which the destruction of the forest has turned many areas into places of unproductive waste.[12]

With respect to the future exploitation of these highland forests, it is significant to note that the outlook is promising, since southwest Asia is generally poor in timber. Future development is directly related to a number of factors, chief among which are, (1) the extension of transportation lines into the highlands, (2) the harnessing of water power, and (3) the introduction of modern machinery and scientific methods of conservation.

Small mineral production.—Although Asiatic Turkey is reported to be moderately rich in various kinds of minerals, these are but little exploited. Extensive coal reserves are found in the north coastal region along the Black Sea, and there is some exploitation at Heraclea. But the total amount of coal produced is less than a million tons annually,[13] the United States mining more than 500 times as much. Copper and lead are also produced in small quantities. In general, therefore, the minerals that are basic to any marked industrial development are but little exploited.

Asiatic Turkey, on the other hand, is more prominent as a producer of emery, boracite, and chromium. In the exploitation of emery it is one of the two leading producers in the world, the other being the Greek island of Naxos. During the period 1925-1931 Turkey mined 6,100 metric tons annually, and this chiefly at Kayabachi in the interior of Anatolia.[14]

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[12] Zon, R., and Sparhawk, W. N.: *Forest Resources of the World,* McGraw-Hill Book Co., New York, 1923, p. 491.

[13] In 1928 the United States produced 576,000,000 tons of coal, whereas the production in Turkey (exclusive of coal consumed at the mines) was only 918,000 metric tons.

[14] Roush, G. A.: *The Mineral Industry,* McGraw-Hill Book Co., New York, 1930, p. 3.

The Turkish emery is used for all kinds of polishing of chrome plating and stainless glass, and for emery cloth and in pastes and compounds. One of the leading users of emery, therefore, is the automobile industry.[15]

Importance of manufacturing.—In spite of its favorable location, Asiatic Turkey, like other countries of Asia, has developed but a small manufacturing industry along modern lines. In fact, only 256,000 of Turkey's 14,000,000 people are actively engaged in manufacturing establishments.[16] Here the factory system remains less important than domestic handicraft. Within recent years, however, there has been a decline in the domestic handicraft in districts traversed by railways, because the peasants find that it pays best to export the raw materials and to buy the cheap foreign goods that are brought within their reach.

Most of the manufacturing industries that have developed are based upon the local supply of raw materials, especially agricultural commodities, as reflected in a few fig and raisin-packing establishments, sugar factories, flour and grist mills, cotton ginneries, textile mills, and saw-mills. The fig and raisin-packing plants are located mainly in and near the centers of Smyrna and Aidin; and several sugar factories have been built recently at Ushak (near Smyrna).

Carpet, rug, and textile manufactures.—Carpet and rug making is an ancient activity and it is widely distributed in Asiatic Turkey. The United States alone imports Turkish rugs valued at approximately $2,500,000. The presence of raw materials and long experience in carpet and rug making have favored the production of these commodities.

In the Cilician Plain, manufacturing is confined mainly to the cotton industry. There are approximately 20 ginning mills in operation in this area, two important spinning mills near Adana, and three cotton seed oil plants. The cotton textile

[15] *Ibid.*

[16] European Turkey is also included in these figures. The percentage of industrial workers as compared with the agricultural people is even less in Asiatic Turkey alone.

industry, not only of this region but of all of Turkey, has been stimulated by the tariff of 1929, which calls for large increases in duties levied on imported textiles.[17]

Lumber industry.—Although forests are found on many of the mountain slopes of Turkey, no large woodworking industry has been established. In fact, such industry is as yet in its infancy. There are, however, hundreds of small enterprises that are interested in woodworking and lumbering operations, but the majority of these concerns have no modern equipment or machinery and operate on a very small scale. Most of the lumber is sawed in the forest very near the spot where the trees are felled. The logs are dragged to saw pits, sawed into boards and planks by crosscut saws, and transported by ox-drawn wagons to the near-by towns to be used locally. This local utilization and meagre commercial development of the lumber industry is due mainly to the paucity of modern transportation facilities in the forested sections of the country, and to the fact that houses in the villages and in the districts in which timber is lacking are built mainly of stone and of semi-dried brick.[18]

Future of manufacturing.—In Turkey there is room for considerable improvement in manufacturing as well as in agriculture, large scale production and the use of modern methods being essentially lacking. For example, the country possesses a potential water power resource estimated at approximately 500,000 horse power, of which only 500 have been developed, or only one-thousandth of the total reserve. Contrast this with Switzerland, where 75 per cent of the total water power has been developed; and Italy with its 61 per cent. The use of hydro-electric power is nevertheless increasing in Turkey, and modern equipment is being installed in various of the industrial plants.

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[17] Keeler, E. P.: "The Cilician District of Turkey," *Commerce Reports* (October 21, 1929), Washington, D. C., pp. 141 and 142.

[18] Gillespie, J. E.: "Markets for Sawmill and Woodworking Machinery in Turkey, Greece, Egypt, and South Africa," *Trade Information Bulletin,* No. 676, Washington, 1930, p. 1.

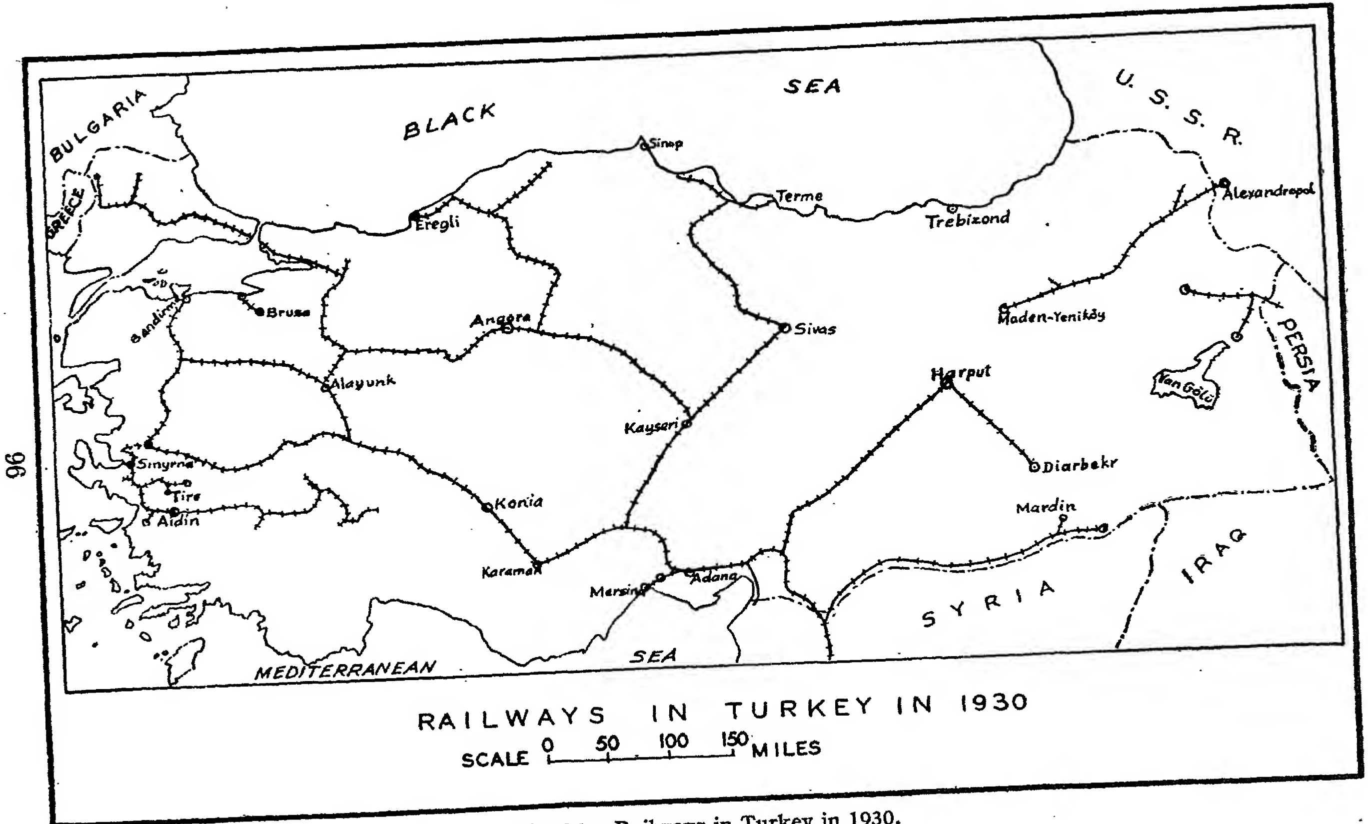

Fig. 26.—Railways in Turkey in 1930.

With the greater development of transportation and the breaking down of certain social barriers, Turkey has a brighter future in the growth of modern industry. In addition, the Government is encouraging the use of native products, chiefly through protection against foreign competition, as has already been indicated with respect to the textile industry.

Inadequate transport facilities.—Inadequate transportation facilities handicap not only the development of agriculture and manufacture, but also the commercial exploitation of forests and minerals. The country contains (1930) only 3,000 miles of railroad line, a little more than half of which is controlled by the Turkish Government and the rest by private interests (Fig. 26). Since 1925 the new Republic of Turkey has begun a definite program of railway development, aiming at the construction of about 1,500 miles of additional line,[10] and the acquisition, control, and operation of the more important privately owned railways.

Although it contains historically important caravan routes, Asiatic Turkey cannot be said to have a good road-system. A road that is destined to be extended through various districts may get good support by some and may be neglected by others. Moreover, after its completion the road is often neglected, seldom being repaired. Such conditions present difficulties to the development of wheeled traffic.

Commerce.—In many parts of Asiatic Turkey there is essentially no commerce, the peasant producing most of his clothing, food, and implements. The low purchasing power of the people further precludes any marked per capita foreign trade. In fact, the country's per capita import trade was only $4.20 in 1931, or 25 per cent as large as that of the United States. The total foreign trade is therefore also small, being only one-fifth as large as that of the little European country, Denmark.

The exports and imports reflect to a considerable extent the opportunities and handicaps of Asiatic Turkey's natural environment. The exports consist mainly of tobacco, raisins, fil-

[10] Gillespie, J. E.: "Railway Conditions in Turkey," *Commerce Reports* (May 19, 1930), Washington, D. C., p. 450.

berts, raw wool, and raw cotton (Fig. 27). The imports, on the other hand, consist chiefly of manufactures such as cotton fabrics, iron and steel, refined sugar, machinery, and wool cloth.

FOREIGN TRADE OF TURKEY

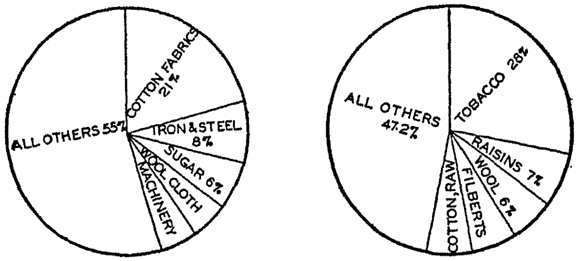

Fig. 27.—The chief imports and exports of Turkey. Note the importance of agricultural products exported and the general preponderance of manufactures among the imports.

Asiatic Turkey's foreign commerce is mainly with Italy, France, the United Kingdom, Germany, and the United States, in the order named. Indeed, 63 per cent of the country's exports are sent to those countries, and 60.7 per cent of the purchases come from them.

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CHAPTER VII

Palestine

The new Palestine.—As the land in which Christ was born, Palestine has commanded the attention and interest of civilized peoples because of her history, literature, and religion rather than her economic importance in the commercial world. It is, in fact, the "Mecca" of Christendom. At present a further interest has been stimulated there, since it has become a National Home for the Jewish people. This recent development has been realized after a long period of suffering under Turkish rule, during which population declined, terraced slopes were abandoned, highlands were ruined by erosion, and many of the coastal districts became unhealthful marshes. Indeed, scientific observers state that this decline continued until the World War, and was reflected in the poor status of agriculture, the chief source of wealth in Palestine.[1]

Since the World War a change has taken place. Great Britain, through its conquest of Turkey, took possession of the country and, under a mandate from the League of Nations, has political control. The British, however, even as early as 1917 recognized the desirability of the establishment in Palestine of a National Home for the Jewish people.[2] Thus, on November 2, 1917—a few weeks before Lord Allenby's entry into Jerusalem—Lord Balfour stated that the British Government viewed with favor the establishment of Palestine as a National Home for the Jewish people and that the British would endeavor to facilitate the achievement of this objective.

[1] Strahorn, A. T.: "Agriculture and Soils of Palestine," *Geographical Review*, Vol. XIX (1929), p. 583.

[2] For an excellent, scholarly article on recent developments in Palestine, see Choveaux, Andrée: "The New Palestine," *Geographical Review*, Vol. XVII (1927), pp. 75-88.

It also became clear that nothing should be done which would prejudice the civil and religious rights of non-Jewish communities that had been established in Palestine.[3]

This declaration, later embodied in the mandate for Palestine, was approved by the League of Nations and endorsed by the United States.

Recent growth of population.—Since the World War many immigrants have entered Palestine, and a new source of development has become possible. The population has increased from less than 700,000 in 1914 to 872,165 in 1931.[4] The influx of Jewish people has been especially marked since the promulgation of the Immigration Ordinance in 1920. At present there are approximately 120 settlements in the country (Fig. 28). These have been extended even to uncultivated, unpromising land. Some have developed in agricultural regions that were formerly abandoned. In many places settlers have drained swamps, planted eucalyptus, cultivated vineyards, and developed citrus fruit orchards.

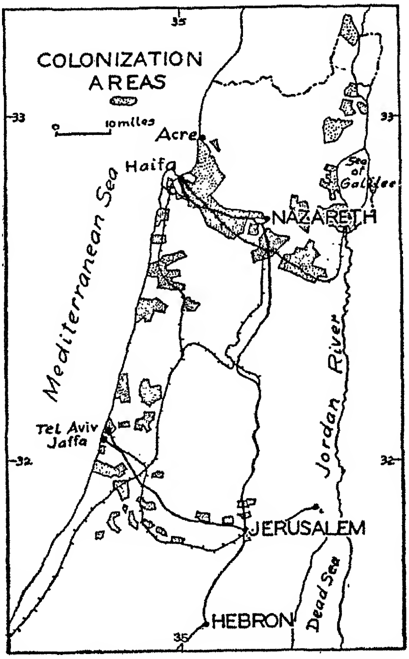

Fig. 28.—The Jewish colonization areas in Palestine.

Population and economic activities.—The population density is not uniform in Palestine, the uneven distribution being the result of unequal opportunities of making a living in various parts of the country. Some areas favor the growth

[3] *Palestine: Report of the High Commission on the Administration of Palestine,* Colonial No. 15, London, 1925.

[4] Exclusive of nomads. According to statistics given in the Statesman's Yearbook for 1933, p. 192.

of population because of their better opportunities for the development of intensive agriculture. Others are located favorably as centers of trade.

Economic activities and natural environment.—Just as the distribution of population is affected by the opportunities and handicaps for industrial development, so the distribution of economic activities is definitely related to the natural environment. Thus, agriculture flourishes in the fertile lowlands where water is available for irrigation, and orchards are found on gentle slopes, or even on steep slopes, where sufficient mantle rock may be obtained for the construction of terraces.

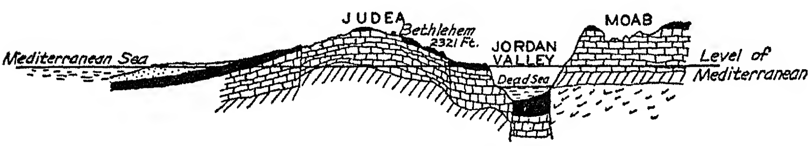

Fig. 29.—East-west cross section in the latitude of Judea from the Mediterranean Sea to Trans-Jordan. Note the level of the Mediterranean Sea as it compares with that of the Dead Sea.

In general, the natural environment does not favor any high degree of industrial development. The country is generally lacking in resources other than the soil. According to geological investigations there is practically an absence of mineral wealth and forests. The country must therefore turn to its soils in order to realize any substantial increase in national wealth and population, and agriculture has long been the dominant activity.

One of the most important factors of the natural environment of Palestine affecting man's economic activities is relief. A cross section from west to east shows a low coastal plain on the west, a hilly and mountainous region in the central part, which slopes steeply downward to the rift valley of the Jordan River (Fig. 29). The country is therefore divided into three regions, which trend essentially in a north-south direction, following the main lines of earth fracture.

The westernmost of these regions—the Mediterranean coastal lowland—becomes narrow with distance from south to north, comprising in its wider southern part the plain of Philistia, and in its northern part the plain of Sharon. Here blossomed the "Roses of Sharon," and here agriculture has long been important. Here also are found the chief orange producing sections and some of the major trading centers. The entire coastal plain has always been significant as a highway of travel. It connects lands located north of Palestine with Egypt to the south; and the people who settled in this area have been engaged mainly in agriculture and commerce.

The hills and mountains of central Palestine constitute another distinctive physiographic unit. Here the land rises gradually from the coastal plain on the west and drops abruptly to the valley of the River Jordan on the east. The northern part of this highland is separated from the rest by the plain of Esdraelon, which is one of the most significant areas of recent Jewish colonization and historically an important highway of travel—a highway used by merchant, soldier, and invader.

North of this plain lies Galilee, in which Nazareth is located; south of it the highlands of Samaria and Judea (Fig. 30). The hills and plateau of Judea have been called the heart of Palestine. Although it is comparatively small in size, this southern highland unit was the center of the past civilization and it is the most important part of the present one. It is, indeed, one of the most densely populated units of the country; and Jerusalem, Hebron, and Bethlehem are located here (Fig. 31).

East of the highlands the land slopes steeply downward to the valley of the Jordan River, which lies below sea level. In fact, within a distance of 20 miles to the east of the highest parts of Judea the land drops from 3,000 feet above sea level to 1,292 feet below that level. This eastward sloping land, located to the leeward of the moisture-laden winds, receives less than five inches of precipitation per annum. Under such conditions the vegetation is scanty, and the sparsely populat-

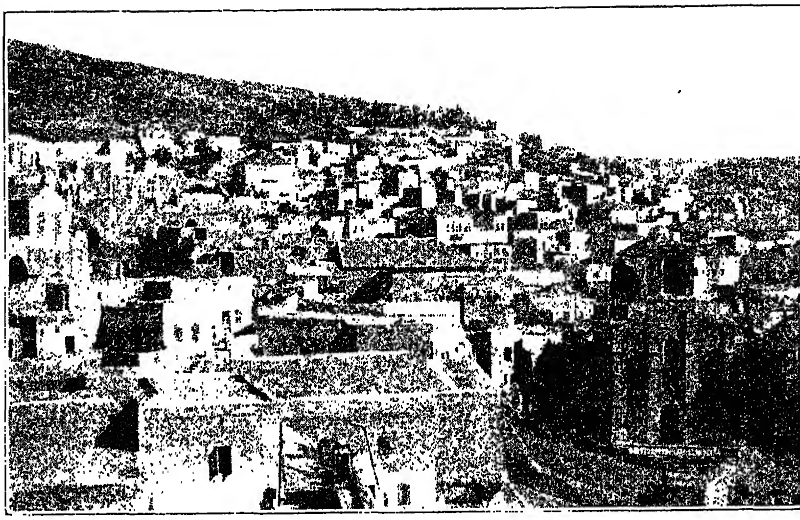

Fig. 30.—In the Hill Country at Nazareth. (Courtesy of Near East Foundation.)

Fig. 31.—Jerusalem—View of Mount of Olives. (Courtesy of Near East Foundation.)

ed land is given chiefly to pastoral nomadism. During the first centuries A.D., it constituted a refuge for Christian monasticism.

Climate and vegetation.—Like the western coastal lowlands of Syria, those of Palestine have a mediterranean type of climate. The coastal areas of Palestine, however, receive less precipitation, the rainfall decreasing with distance southward from more than 30 inches in the north to less than five inches in southern Palestine. On the windward western slopes, especially of Galilee in the north, the precipitation is moderately abundant but decreases rapidly with distance eastward, leeward slopes receiving but little rain—as reflected in the rainfall of less than five inches in the Jordan Valley, located east of the central highlands. For Palestine as a whole, therefore, the precipitation decreases from north to south and from west to east (Fig. 32).

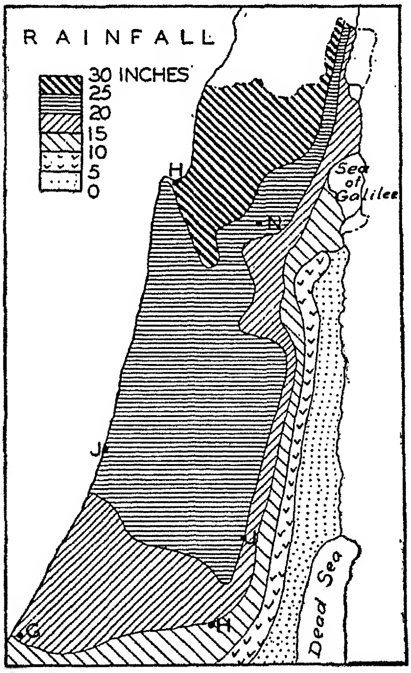

Fig. 32.—The annual rainfall of Palestine. (After A. T. Strahorn and the *Geographical Review*.)

Precipitation, however, varies not only from place to place but also from season to season, the dry season lasting from April to October and the rainy season from October to the latter part of March (Fig. 33). Such distribution constitutes a marked disadvantage to agriculture, since the rains come during the winter half-year, the period of relatively low temperatures. Irrigation is therefore practiced wherever possible and many ancient cisterns, pools, and aqueducts attest the importance of former works of irrigation. Even at pres-

ent, cisterns and springs constitute the chief sources of drinking water.

In this land of winter rain and summer drought, native vegetation consists chiefly of drought-resistant varieties characteristic of a mediterranean climate. Forests are essentially

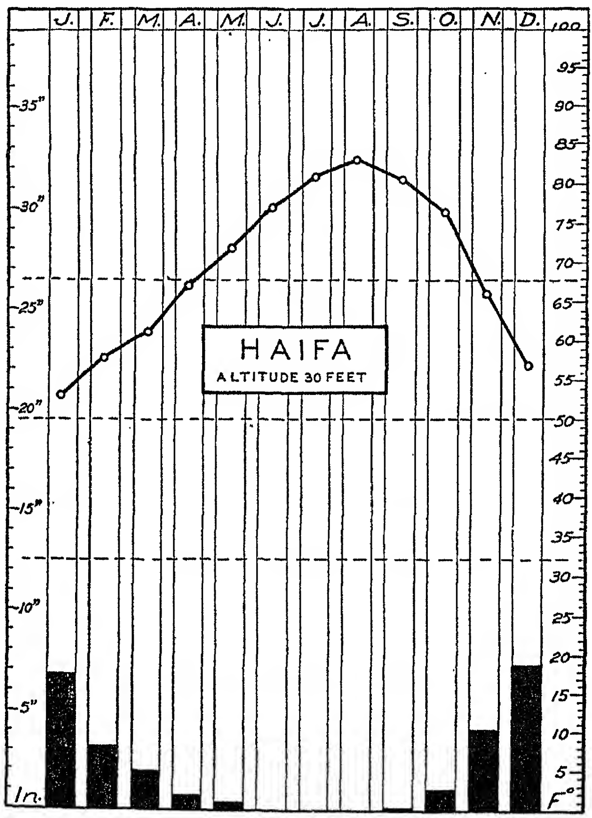

Fig. 33.—The average monthly temperature and rainfall at Haifa, Palestine. Note the mediterranean rainfall regime.

lacking, small, scattered areas of trees being found only on windward, highland slopes, chiefly in the northern part of the country. Plantations of eucalyptus and various types of shrub are found in some areas. Among cultivated trees, the olive is at home in Palestine. In addition, the country contains many fig, almond, and orange trees.

Agriculture, the chief source of wealth.—Practically lacking in forests and containing but few minerals, Palestine early became an agricultural country. Here the beginnings of agriculture date back beyond the time of recorded history. But during the last centuries agriculture declined in many districts, and numerous, eroded, rocky slopes contain evidences of former tillage.

Because of the relatively large stretches of rugged and arid highlands, approximately one-third (3,000 sq. miles) of Palestine is barren or waste capable of little if any agricultural development, and perhaps an additional one-fifth (1,800 sq. miles) may be classified as uncertain from the standpoint of such development. The remaining 47 per cent of the land has definite agricultural possibilities, but further expansion is limited in part by the availability of water for irrigation.

Subsistence agriculture still constitutes the chief type, the methods of which are often crude and primitive. Each family grows wheat, this grain being indigenous to the Mediterranean Basin and the most widely cultivated plant of Palestine. In addition, millets, grain sorghums, barley, olives, figs, and citrus fruits are produced in many districts.

The value of the olive to Palestine is noteworthy. Almost every home has its olive orchard, which requires but little care. When the trees are once planted, they constitute a valuable possession, some of them having produced fruit for hundreds of years.

Recent developments in agriculture.—Associated with the recent development of Palestine as a National Home for the Jewish people there has been a marked development of plantation agriculture. Large sums have been spent for the purchase of land for settlement purposes, considerable areas of swamp land have been drained, and rocky slopes have been terraced. The grape—a plant typical of Mediterranean regions—is being grown in increasing quantities for the making of wine. In addition, oranges have become an important commercial crop of the country.

Oranges most important commercial crop.—At present

oranges are the most important crop of Palestine, and their culture has developed rapidly within the last decade. It has been one of the most pronounced developments of commercial production within this country. The total value of orange exports constitutes more than 40 per cent of the value of all commodities exported from Palestine. This crop is practically confined to the districts in which new settlements have been made, and here oranges are grown under modern conditions. The most important district is located on the coastal plain in the vicinity of Tel Aviv and Jaffa. Here climate, soil, and irrigation waters favor production, and the coastal location is important from the standpoint of the export trade.

The future of agriculture.—Although Palestine grows a variety of agricultural commodities, local production does not satisfy local needs. In fact, the value of imports of agricultural commodities exceeds the value of exports by a considerable margin. More scientific agricultural practices are essential before the country becomes self-sufficient. Agricultural experiment stations have been established recently and surveys have been made of soil conditions, fertilizer requirements, and water supply with a view to placing agriculture on a more scientific basis (Fig. 34).[5] In some districts the yield of wheat has been raised from an average of 9 bushels to 20 bushels, and barley from 5 to 40 bushels per acre.

In foreign lands the Jew is engaged mainly in work that is non-agricultural in character. In Palestine agriculture is the dominant activity. The question therefore arises as to the future of these non-agricultural people who have settled in an environment that is harsh, and who are forced to obtain their livelihood from the soil.

Mineral resources.—Although the mineral resources of Palestine have not been thoroughly investigated, partial surveys disclose the fact that the only potential mineral wealth of importance is found in the waters of the Dead Sea. Some

[5] *Commerce Reports* (Feb. 20, 1928), Washington, D. C., p. 470.

potash, salts, phosphate rock, and sulphur comprise the field of Palestine's mineral resources.

Manufacturing unimportant.—Palestine is relatively unimportant as a manufacturing nation. It is handicapped by the paucity of local raw materials; and therefore practically all

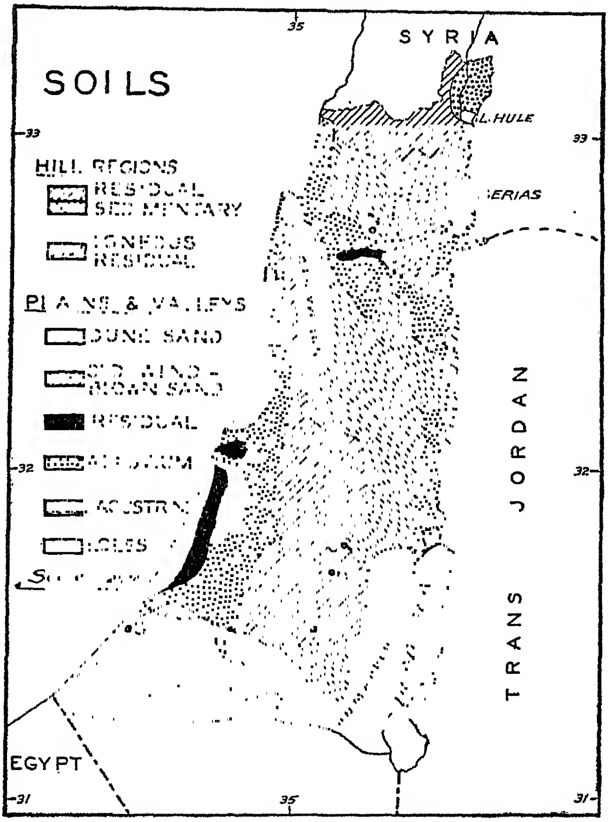

Fig. 34.—A generalized soil map of Palestine. (After A. T. Strahorn and the *Geographical Review*.)

the manufacturing that is done consists of working certain of its agricultural and mineral products. Among the older and more important of these industries may be mentioned flour milling, extraction of vegetable oils, the production of soap, wine, cigarettes, silicate bricks, and cement. In addition, a

small textile industry has developed. Even in the manufacturing of these simple needs the methods are very crude.[6]

At present a project is under construction which will furnish an abundance of power for manufacturing. It is called the Rutenberg project, and has received the official sanction of the Palestine Government. This calls for the harnessing of the Jordan River at intervals from its source to the point

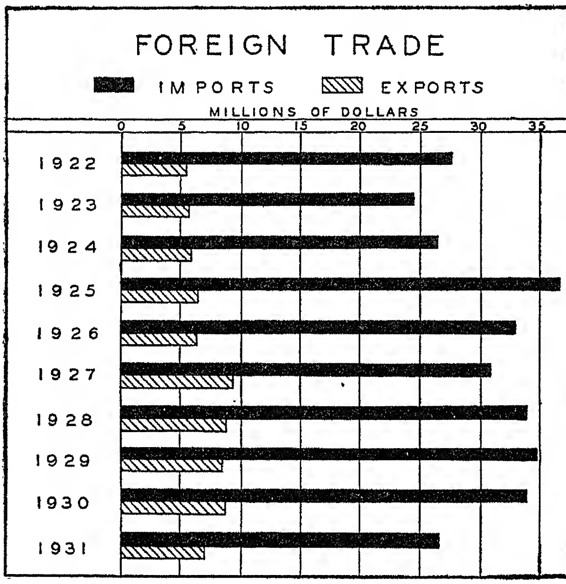

Fig. 35.—The value of the exports and imports of Palestine since 1922.

where it empties into the Dead Sea. In addition, the plan calls for the construction of a system of irrigation that will convert many areas of the arid land into farms.[7]

Foreign commerce.—Because of its small area and population, paucity of manufactures, and limited natural resources, Palestine's foreign trade is small. It is also extremely adverse, the imports normally exceeding the exports by a considerable margin (Fig. 35). But there are many invisible items among Palestine's exports. These consist of services to travelers and

[6] *Ibid.*, p. 471.
[7] *Ibid.*, p. 471

money remittances from abroad, which tend to bring about equilibrium in trade.

The imports consist mainly of textile goods, wheat flour, government stores, petroleum, and automobiles; whereas the exports include oranges, soap, vegetables, wines, and curios.

The foreign trade of Palestine is conducted chiefly through the coastal ports of Haifa and Jaffa, of which Jaffa is the more important. It is the leading commercial city and the chief center for the export of oranges. It is connected with Jerusalem both by improved highway and rail, but it is handicapped in having inadequate harbor facilities. It is necessary for ships to anchor about a mile from shore, cargoes being lightered to and from the port.

Haifa, however, has a very favorable location; and it is therefore being developed into a large port. It occupies an important position at the seaward end of the plain of Esdraelon, which is a natural highway between the Jordan Valley and the Mediterranean coast. It is the terminus of the Cairo-Kantara-Lydda-Haifa line, and the center of many good motor roads that radiate from it.

Outlook.—From time to time a pawn in the hands of her more powerful neighbors, Palestine was conquered many centuries ago by the kings of Babylon and Nineveh, who in turn were conquered by the Persians. At the time of Christ, Palestine, like the rest of the Mediterranean world, was under the Pax Romana, and later fell under the sway of the Mohammedans in their vigorous movement to encircle the world with the crescent. Again a battle ground during the World War, Palestine was the much coveted prize among the imperialist nations who were carving up the Turkish empire, and at the present time constitutes a National Home for the Jewish people.

The people of this land will always have to live on a narrow margin, but by developing the tourist trade and by concentrating their efforts on public works in periods of drought, their lot can be improved. With only a few fruits and vegetables produced in excess of local consumption, Palestine is

not self-supporting with respect to the major food products; and until recent years transportation facilities have been so poor that the limited surpluses of the country could scarcely be marketed. With the larger part of the country located in areas of low rainfall and poorly equipped with irrigation facilities, Palestine will be forced to depend upon fall sown crops.

In this region of dry summers, the recent growth in the citrus fruit industry has been associated with the development of irrigation agriculture. The production of fruits and vegetables appears to be a favorable type of economic pursuit and should be further encouraged.

Since Palestine is the "Mecca" of Christendom, a great number of religious pilgrims visit the country every year, and more will do so as political stability becomes assured. The money which remains within the country by reason of these pilgrimages is an item of considerable importance. It enables the local inhabitants to purchase goods in foreign countries, and therefore explains in part the unbalanced merchandise trade.

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CHAPTER VIII

Arabia

Significance of the country's location.—Arabia is a peninsula approximately one-third the size of the United States. It bridges the space between the Gulf of Oman and the Persian Gulf on the east and the Red Sea on the west. It extends from Iraq, Palestine, and Syria on the north to the Indian Ocean on the south. By reason of its location, the Arabian peninsula therefore is accessible by sea to widely separated regions. But the geographical factor of location means also that Arabia is part of a climatic realm which consists essentially of desert and steppe and where pastoral nomadism is the most widespread economic activity.

Political divisions and control of Arabia.—The greater part of this peninsular area is parcelled out internally among a number of autonomous states, most of the remainder being under British protection. Chief among the autonomous states are the Kingdom of Hejaz and Nejd, Yemen, and Oman (Fig. 36). In the south the Aden Protectorate is directly under British control, whereas Hadhramaut is loosely under British protection and control.

The Kingdom of Hejaz and Nejd embraces most of the land bordering the Red Sea and a large part of interior Arabia. Even the principality of Asir was placed in 1926 under the protectorate of Ibn Saud, who is King of Hejaz and Sultan of Nejd. The land under the control of this ruler contains more than half the people of Arabia. It also contains Mecca, the Holy City of Islam.

Yemen, located in southwestern Arabia, was until recently under the political power of Turkey. Today it is under the control of one of the powerful rulers of Arabia, the Imam of

Sana. The area under the control of the Imam and his sons covers approximately 75,000 square miles of land and contains between two and three million people. It is therefore more densely populated than the other large political units

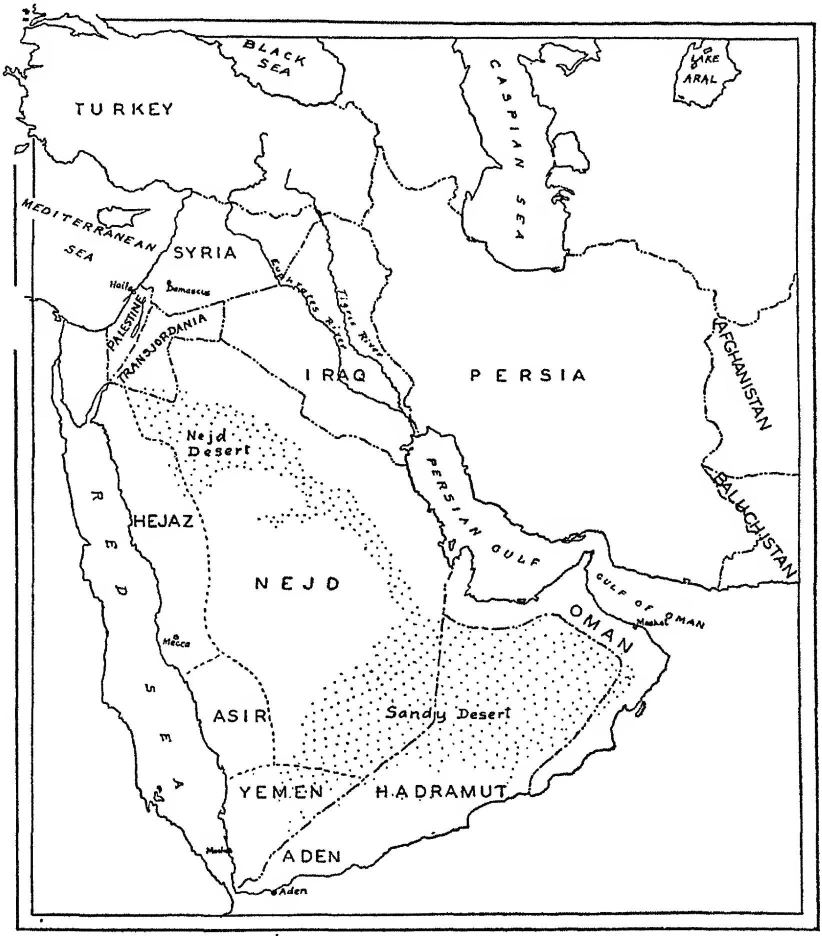

Fig. 36.—Map showing the political divisions of the Arabian Peninsula as well as the relative location of countries in this part of Asia.

of Arabia, chiefly because of the more abundant precipitation and greater importance of sedentary agriculture.

In the southeastern part of Arabia is located the independent state of Oman. It extends southwestward to the interior

desert, and embraces an area of 82,000 square miles of land. This area is inhabited by 500,000 people, most of whom are Arabs. But the coastal districts contain a large number of Negroes.

In addition to these major states may be mentioned a long list of autonomies in Arabia, there being many tribal communities which give effective allegiance only to their own chiefs. These are found chiefly in the back-country of Yemen, in the Asir highlands, in the interior of Oman, and all around the northern fringe of the Nefud Desert. "This parcelling out of the peninsula among many autonomous states is of immemorial antiquity. The peculiar geographical conditions of the country hardly admit of settled life, except in oases isolated by desert, or in wadis divided by rugged and comparatively barren ridges; and it is only by virtue of some peculiar source of wealth, some spiritual idea, or, lastly, some external strength, that larger territorial dominions have been established and maintained in various places."[1]

Physical framework and land surface.—From a physical standpoint the Arabian peninsula is characterized above all by its dry highland character. A large part of it consists of plateau. This highland decreases in altitude toward the east, and is flanked on its western side by mountains which rise in Yemen to altitudes of more than 8,000 feet. In this western part of the peninsula the mountain ranges are parallel to the Red Sea, and from this highland region the surface slopes gradually toward sea level with distance eastward (Fig. 37). The uniformity of this slope is interrupted only in the extreme southern part of the peninsula, where the mountains of Oman extend their summits to elevations exceeding 9,000 feet above sea level.

The greater part of interior Arabia consists of extensive gravelly plains, sand dunes, and hard-surfaced tracts of steppe country. A comparatively hard gravelly plain, covered here and there with parallel belts of sand, stretches across a large

[1] H. M. Stationery Office: *Handbook of Arabia,* London, p. 16.

part of eastern Arabia. In the west central part of the country are found patches of corrugated and fissured lavas or scoriae (locally called "harrah"), overlying either plain or mountain. A large part of the steppe country, chiefly in west central Arabia, contains a hard or dusty land surface, with occasional water-holes. In this region, a chosen home of many

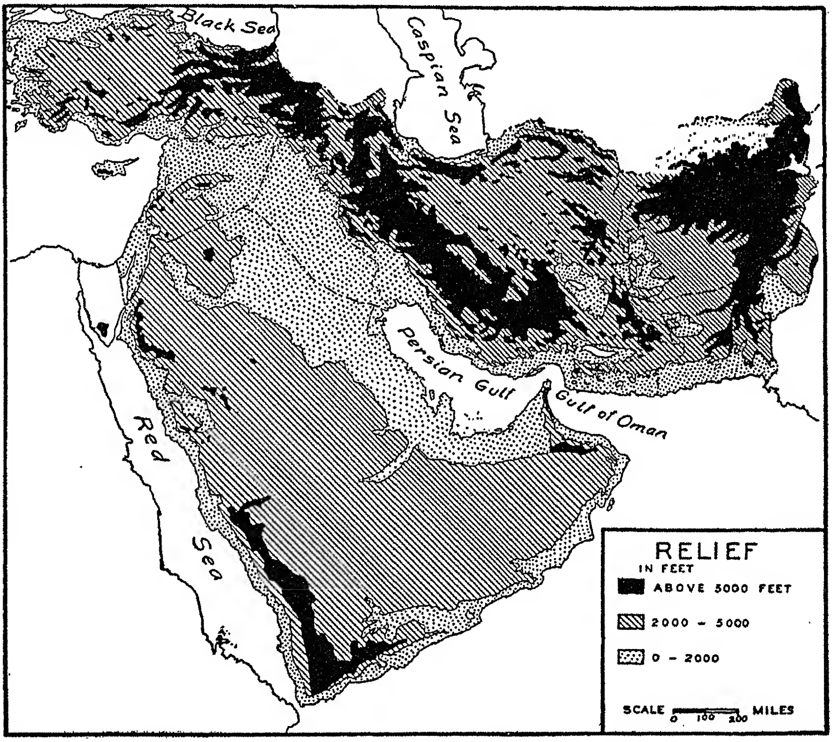

Fig. 37.—Relief map of Arabia and adjacent countries. (Altitudes according to J. Paul Goode.)

camel-breeding nomads, the native grasses flourish chiefly in hollows or depressions.[2]

In some places the regularity of the land surface is broken by river beds, or wadis, which carry the floods after rainstorms. In general these do not serve as beds for perennial streams; since indeed there are no rivers in Arabia which flow peren-

[2] *Ibid.*, p. 3.

nially from source to mouth. But the wadis are very important from the economic standpoint, since they contain fertile soil suitable for crop production where water for irrigation is available. Such water is frequently obtained by sinking wells into the lower parts of the wadis. In addition, the native grasses often flourish in the wadis when the surrounding land

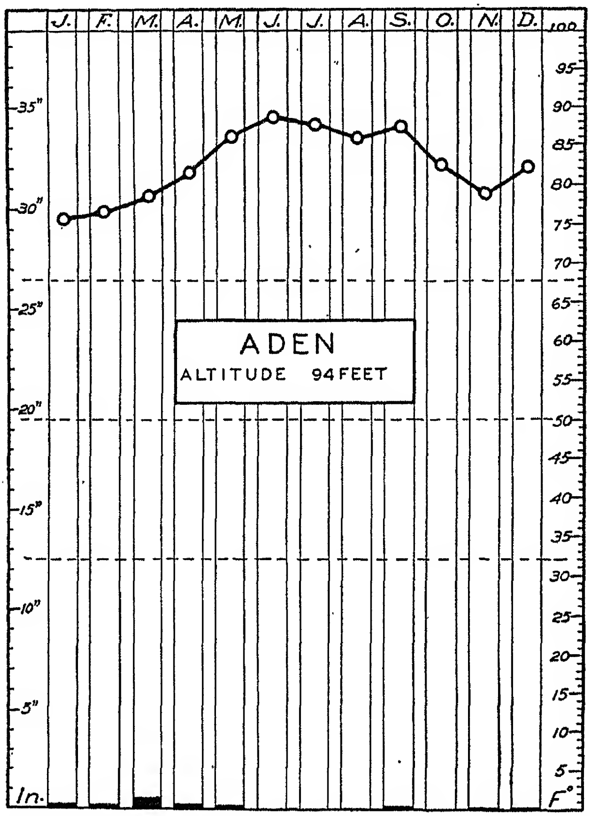

Fig. 38.—Absolute desert conditions are found at Aden, the average annual precipitation being only 2.3 inches. Note the high temperature during all months of the year.

is lacking in vegetative cover, and they are therefore eagerly sought by the pastoral nomad.

The coasts and harbors.—Between the mountains and the Red Sea lies a narrow coastal zone, which becomes even smaller with distance southward. In this coastal area good har-

bors are scarce, and the approaches to them are sometimes rendered difficult because of reefs and shoals. In the southern part of Arabia, also, there are no good harbors except at Aden. On the east coast the port of Muscat contains a sheltered harbor which admits even the largest vessels. In the area of the Persian Gulf, however, numerous reefs and shoals render navigation difficult. This coastal strip is served by the harbor of Koweit.[3]

An arid land.—Arabia is typical of the greater part of southwest Asia in being not only a highland but also a dry land (Fig. 38). The rain bearing winds expend their moisture on the outer slopes of the coast ranges, especially in Asir and Yemen, and reach the interior impoverished. The plateau interior therefore consists essentially of desert and steppe where nomads pasture their sheep, goats, camels, and horses. Only the highlands of Yemen and Asir receive sufficient periodic rains for cultivation.

Another striking feature of the climate of Arabia is the extreme range in temperature, which is most marked in the interior. Here frosts are common during the winter season and the temperatures of summer hover above 100°F. Even some of the coastal districts experience extremely high temperatures in summer. Thus, temperatures of 114°F. have been recorded along the coast of Oman. In many of these humid coastal districts the heat of summer is very oppressive, whereas the greater part of central Arabia because of lower relative humidity has a more invigorating climate.

The population.—The vast stretches of desert and steppe, the extensive practice of pastoral nomadism—these suggest a relatively sparse population. In fact, Arabia contains about 7,000,000 people, or seven persons per square mile of land (Fig. 39). The highest population densities are reached in the intensively cultivated parts of the Yemen highlands where the people are engaged in sedentary agriculture and in trade. The other densely populated districts include the large

[3] *Ibid.*, p. 5.

oases of Arabia and the coastal trading districts. On the other hand, a large part of the southern desert, which stretches from Yemen to Oman, is practically uninhabited. But the highland steppes to the north of this desert support numerous scattered Bedouin tribes.

The people of Arabia belong chiefly to the Semitic race. Along the coastal districts there is a mixture of other races—Phoenician, Turkish, Negroid, and Hamitic. But the inhabitants of the interior of the peninsula are the nearest existing approach to the pure Semitic type. Although physically one of the finest races of the world, they are deficient in organ-

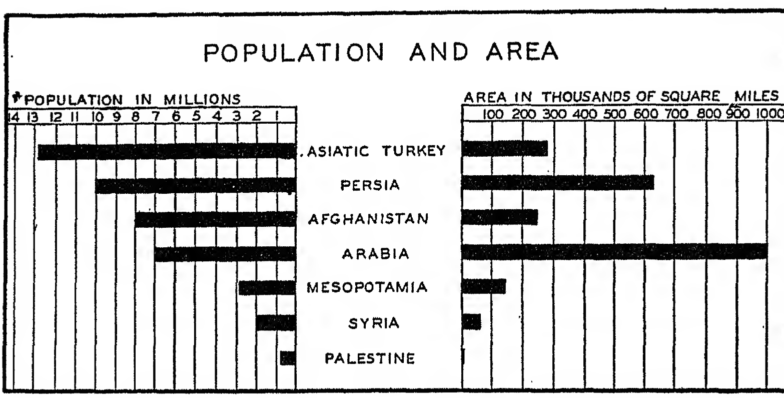

Fig. 39.—Diagram showing population and area of important countries of southwestern Asia.

izing power and lack the necessary capacity for combined action. They dislike government control and restriction. The desert environment has given the Bedouin the independent spirit of the free-man.[4]

The importance of pastoral pursuits.—The insufficiency of the rainfall makes agriculture practicable only in certain small areas, and therefore the livestock industry—especially the raising of sheep, goats, and camels, and to some extent the breeding of horses—is the dominant economic activity for the greater part of Arabia. The ranking place of hides and skins

[4] *Ibid.*, p. 10.

among the country's exports attests the significant place of the livestock industry.

Camels.—Arabia is the leading camel-breeding country in the world, having in a normal year approximately 750,000 of these animals. The largest and most powerful camels are raised in the northern part of the country, chiefly by the Anaize tribe. The fastest animals, used chiefly for riding purposes, come from central Arabia and the interior districts of Oman and Aden.

Since camels can live, even in the dry season, on thorny acacia, tamarisk, and the salt bush, they are especially well adapted to an arid environment. But these animals can do and endure more when they are able to browse on succulent spring pastures. When used for some special achievement they are fed on pulse, knotgrass, millet, flour, and sometimes on dates. A caravan of camels usually travels at the rate of 2.5 miles an hour. On desert routes these animals can carry about 330 pounds apiece. They have also other uses. During spring and early summer the nomads use the milk of the camel, and the animal's flesh and skin are also of great value.[5]

The trade in camels is carried on largely through Damascus and Bagdad. From these centers buyers, usually recognized caravan guides, are sent into the interior. Since the distances are often great it takes a long time before the camel buyer returns to the trade center from which he was sent. The animals are usually pastured as they travel across the desert. It is estimated that approximately 45,000 camels are sold each year, and most of these are finally marketed in Africa and Mesopotamia.

Sheep and goats.—According to recent estimates there are approximately 3,500,000 sheep in Arabia.[6] These animals are found wherever there is pasturage. They are, however, relatively less important than horses and camels as a source of wealth in Nejd and are surpassed in number by goats in the

[5] *Ibid.*, p. 73.

[6] U. S. Department of Agriculture: *Foreign Crops and Markets* (March 23, 1931), Washington, D. C., p. 354.

rugged highlands of Oman. They are most numerous in northern Arabia, where the Bedouin tribes graze large flocks of sheep on the steppe pastures between Palestine and Mesopotamia. Although black sheep are raised by the Abida tribe in Asir, the most common variety in Arabia is the fat-tailed sheep. These animals supply a number of local needs, and their skins constitute a valuable export.[7]

Goats are more numerous than sheep in the rugged and barren districts, but they are less numerous in the better watered steppe. Large numbers of these animals are therefore raised in the rugged lands of Oman and in the dry interior areas. They survive the most rigorous winters of central Arabia by feeding on mimosas and acacias. They yield various products of local and commercial value. From their hair the Arab makes tents and clothing; their milk and flesh are important local foods. Some of the milk is made into ghi, a variety of butter that is commonly used in the East.

The importance of irrigation agriculture.—In the greater part of Arabia high temperatures and scanty rainfall combine to make irrigation essential. Only relatively narrow strips of highland in Yemen, Asir, Aden, Hadhramaut, and Oman get moderately abundant rainfall; and this frequently is very ineffective owing to its erratic distribution. Since the rainfall is commonly associated with thunderstorms, it is torrential in character. It would be more useful for agriculture if it came in the form of gentle showers. In parts of Yemen and the Aden Protectorate heavy fogs in spring and early summer help sustain crop growth until the summer thunderstorms appear.

Terrace cultivation was early developed in Arabia and spread eastward as well as westward into other lands, especially from Yemen, which now has a climate that is believed to be much drier than formerly. After the death of Mohammed (A.D. 632) the Arabs spread eastward into the dry lands of

[7] Of the animal products, ghi, or semn, is made throughout Arabia. It is a variety of butter, much valued as an article of diet. It is produced by beating sheep, goat, or cow milk in a skin with sticks.

Baluchistan and the Indus Valley, carrying with them not only their Mohammedan religion but also their irrigating skill. To the westward they spread into north Africa and even as far as the Iberian Peninsula, where the present terrace and huerta (garden) cultivation is essentially the same as that introduced by the Arabian conquerors of these regions.

Most of the irrigation districts of this country are distributed with respect to (1) wadis, (2) wells, (3) rain cisterns, and (4) underground conduits. Some of the most important oases of Arabia are located in wadis. Fertile topsoil, moist subsoil, access to underground water—these favor the wadi as an important site for crop production.

Sometimes the wadi is filled with water, which may be diverted into channels by dams. In the case of a dry wadi the subsoil is frequently sufficiently moist for crop production.

In some parts of Arabia wells are the chief source of irrigation water.[8] Water is commonly obtained from depths of 50, 60, and even 100 feet, and it is often raised in leather buckets by means of large draw wheels worked by animal traction. Oil pumps, recently introduced into irrigated districts of Mesopotamia and Persia, could readily be substituted for animal traction if petroleum could be obtained easily.

Rain cisterns and conduits are utilized to a considerable extent in the highlands of Yemen, Aden, Hadhramaut, and Oman. Cisterns are built in the coffee growing districts of Yemen, where the storm water would otherwise go to waste. In Oman conduits are often used to bring water down from the highlands, and in this respect are similar to the kanats of Persia (see pages 144-145).

Importance of date cultivation.—Dates constitute not only an important item of export, but they are commonly used as the staple article of food over large areas of Arabia. Many sedentary tribes devote themselves almost exclusively to date growing. In fact, according to recent estimates Arabia contains approximately 9,000,000 date palms, or ten per cent of

[8] The Teima, Kheibar, Harik, Riad, and Jebel Shammer oases are among those obtaining water from wells.

the world's total.[9] More than three-fourths of the Arabian trees are found along the Persian Gulf and the Gulf of Oman, in Hasa and Oman.[10] In the western part of Arabia, Hejaz is most important. Here production is concentrated chiefly in the Medina district (300,000 trees). Interior Arabia, on the other hand, is relatively unimportant in the commercial production of dates.[11]

Coffee.—Although it is far less widely distributed than date palms, coffee constitutes a very important source of wealth. It is produced chiefly in the highlands of southwestern Arabia, especially in Yemen, where it has had a long and important history. Here Mocha, Hodeida, and the Taiz districts grow the much-prized Mocha coffee, a commodity that is known throughout the commercial world for its high quality. Among the favorable conditions for coffee found here are: (1) rolling topography, which insures free drainage of both air and water; (2) fertile soils; (3) general absence of insect pests; and (4) heavy mists which precede the thunderstorms of summer, and therefore aid in providing the necessary moisture. Moreover, the mists are an important factor in moderating high temperatures during summer days. Most of the plantations are terraced on the hillsides, and irrigation by means of cisterns supplements the normal rainfall and heavy mists.

Other crops.—Cereals are widely cultivated in Arabia, but the amount raised is too small to meet the local demand; and therefore large amounts of grain are imported. The chief cereals grown are millet, grain sorghum, maize, wheat, and barley. The low-lying littoral and highland districts of southwest and southeast Arabia are the chief centers for cereal production. In addition to the cereals, various crops such as rice, tobacco, sesame, indigo, cotton, and sugar cane are grown in small quantities.

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[9] Popence, Paul: "The Distribution of the Date Palm," *Geographical Review*, Vol. XVI (1926), p. 117.

[10] Coastal Hasa contains approximately 3,300,000 date palms; whereas Oman has 4,000,000.

[11] The total number of date palms for the large interior areas of Nejd and Jebel is about 500,000.

General scarcity of forest and mineral resources.—Arabia is essentially a treeless country, the forests occupying perhaps not more than 1.5 per cent of the total land area.[12] The entire interior region is almost entirely without trees. The only important wooded areas are found in the peripheral units of the country, especially in the more moist windward highlands which flank the interior tableland (Fig. 40).

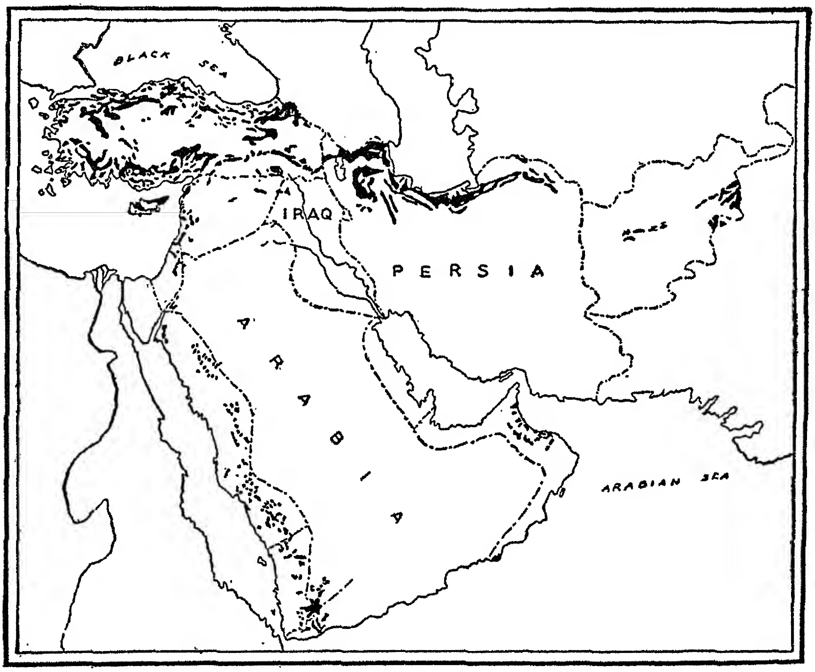

Fig. 40.—Distribution of forests in southwestern Asia. (After Zon and Sparhawk.)

Of the various trees found in Arabia, the date palm, tamarisk, acacia, the mimosa, and the jujube are the most important. The date palm furnishes not only fruit, but also timber and fiber. The tamarisk is especially well suited for cultivation in desert and steppe lands. It has been suggested that large tracts of the arid interior might be utilized for the pro-

[12] Zon, R., and Sparhawk, W. N.: *Forest Resources of the World,* McGraw-Hill Book Co., New York, 1923, p. 351.

duction of this tree.[13] It may be planted even in loose sand, watered for one year, and subsequently grows without further care. The acacia tree is used to some extent in boat building, whereas the thorny acacia contains food for grazing livestock. The jujube tree also is exploited for its timber, especially in the southern part of the country.

Arabia contains a number of minerals, but only salt is of any commercial importance at the present time. Large quantities of salt are obtained by evaporating sea water, especially at Aden.[14] In some places rock salt is found. In the last few decades large quantities of salt have been exported to adjacent lands and even to India. These exports have been largely through the port of Aden.

Other minerals include petroleum in the Farasan and Bahrein Islands; gold, sulphur, and coal in Yemen; precious stones, such as onyx and agate in the hills near Sana, Yemen; and iron ore in Yemen and the coastal area of the Persian Gulf. These, however, are but little worked at the present time. One of the major handicaps to exploitation of some of the minerals is the general lack of fuel.

The most recent noteworthy development in the mineral industries has centered in the Bahrein Islands. These have long been the center of the important pearl fisheries of the Persian Gulf. Now the Standard Oil Company of California has acquired a concession in these desert islands for the exploitation of petroleum. Wells have already been drilled in the central part of Bahrein, the largest island of the group, and the production is rapidly increasing as new wells are brought in.[15]

The pearl fisheries.—Although the net and line fisheries of Arabia are locally important along the whole coastal area, only the pearl fisheries are of major commercial significance—

[13] Doughty, C. M.: *Travels in Arabia Deserta,* Cambridge, 1888.

[14] In normal years more than 100,000 tons of rock salt are produced by several large salt works at Aden.

[15] Gester, G. C.: "Oil Development on Islands in the Persian Gulf—Outpost of Standard Oil Co., of California," *The Oil and Gas Journal,* Vol. XXXII (1933), pp. 94-96.

the latter being usually second only to hides and skins among the country's exports. These fisheries are confined to the area of the Persian Gulf. Here 184 pearl banks are located between 24° 10′ and 27° N. latitude. The important center for this area is Bahrein.

Manufacturing.—Arabia, like all of southwestern Asia, is still in the agricultural and pastoral stages of economic development. Nearly all of Arabia's manufacturing is merely an attempt to supply a part of the relatively simple domestic needs. Here industry lacks modern appliances. Manufacturing of the modern factory type calls for large capital, skilled labor, good transportation facilities, abundance of power, large consuming markets, and raw materials. In Arabia these are generally lacking in favorable combination.

The small domestic industry that has developed is concentrated mainly in the coastal centers. There is some gold and silver work done by skilled craftsmen at Muscat, Oman. Coarse cotton and woolen textiles are manufactured at various centers, the famous Arab cloaks (abbas) being made from such materials. Hodeida, Yemen, is the center of the sandal-making industry. Here also the dhow-building (making sailing vessels) is concentrated.[16] The material for the dhow is obtained partly from the native acacia found in the Yemen uplands and partly from planks imported from India. Among other native industries are straw-plaiting and mat-making at Aden and Asir, and cigarette manufactures and distillation at Aden.

Foreign commerce.—It is difficult to gauge the exact amount of Arabian foreign trade because of the general lack of reliable information, and in the smaller ports data are entirely lacking. But on the basis of information available at some of the larger ports—Aden, Hodeida, Muscat, and Bahrein—it appears that the foreign per capita trade of Arabia is

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[16] The small dhow, a sailing vessel with a length of about 50 feet, a lanteen sail, and a sturdy mast, is used for lighterage purposes. The larger vessels, built on the same lines, are used for coastal traffic. H. M. Stationery Office: *Handbook of Arabia,* London, 1920. p. 87.

small. For the country as a whole the total value of exports and imports perhaps does not exceed $100,000,000, approximately one-half of which is normally handled at the single port of Aden.[17]

Among the leading items of Arabia's export trade are hides and skins, pearls, coffee, and dates. From the standpoint of value, these in normal years constitute more than three-fourths of all the country's exports. Many of the hides and skins, however, are not of Arabian origin, but have been imported chiefly from northern Africa, being exported later mainly through Aden. Such re-export trade is also clearly marked in the increasing quantities of cotton textiles handled through Arabian ports, especially through Aden. Pearls, on the other hand, are of local origin. They are obtained mainly from the coastal waters of Hasa and Oman, the chief exporting center being Bahrein. More than 90 per cent of the country's coffee is exported from Aden and Hodeida; whereas Muscat, Oman, handles more than 90 per cent of the date exports.

Arabian imports consist mainly of manufactured goods and food, because of the meager development of local manufactures and the inadequate supply of agricultural commodities, especially the cereals. Textiles normally rank first on the export list, and these are followed by grain and pulse. Large quantities of rice are imported each year from Burma, and wheat is obtained mainly from Basra, Iraq. Coal and oil are becoming increasingly more important among the imports. Coal, used largely for bunkerage purposes, is received almost entirely at Aden; whereas oil, second among the imports at Aden, is received at various Arabian ports.

Importance of Aden.—The trade of Aden is especially noteworthy. This port handles more trade than any other city in Arabia. It is primarily a distributing and collecting center for the imports and exports, not only of Arabia but also of African regions, its local trade being relatively small. This position is indicated by the large extent to which the same

[17] The foreign trade of Arabia is therefore probably less than one-fourth as large as that of the little country of Norway.

commodities occur as both exports and imports. Coffee and salt are the only leading exports which are largely of local origin. The city is one of the most important coaling stations in the world.

Aden has grown from a town of 600 inhabitants in 1839, when it became a British possession, to a city with about 57,000 people. By reason of its geographical location, it has drawn the elements of its population from diverse racial groups—Arabs, Somalis, Jews, Indians, and Europeans. A number of factors have contributed to the growth of Aden. Among these are: (1) good, protected harbor; (2) strategic location; (3) harbor facilities; and (4) a large trade area.

Inadequate transport facilities have handicapped general trade developments in southwestern Arabia. The camel still leads as a vehicle of transport. According to recent statistics (1930) compiled by the U. S. Department of Commerce, Arabia contains only 1,055 miles of road, 90 per cent of which is classified as unimproved.[18]

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[18] Curran, T. B., and Root, B. F.: "Highways of the World," *Commerce Reports* (January 13, 1930), Washington, D. C., p. 77.

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CHAPTER IX

Iraq and Persia (Iran)

IRAQ

Rebirth of an old nation.—Iraq, or Mesopotamia, the seat of ancient powerful empires, was free from the Turks during the World War, recognized as a Kingdom, and placed under the mandate of Great Britain. This country with its 143,250 square miles of land embraces the former Turkish vilayets of Bagdad (54,540 square miles), Basra (53,580 square miles), and Mosul (35,130 square miles) and constitutes the home of 3,300,000 people.

In Iraq economic life is concentrated in the great lowland region. Here the Euphrates and Tigris Rivers deposit large supplies of fertile river mud, drawn from the highlands to the north and northwest, especially those of Armenia. These deposits are laid down in an area which is climatically a low latitude steppe. The early civilizations which took their rise in these lowlands near the head of the Persan Gulf were forced, therefore, by reason of the semi-arid climate to practice irrigation, which in this region reached a high state of perfection before it fell to ruin under the "Turkish hoof."[1]

Surface features: mainly an alluvial lowland.—Iraq, unlike other major units of southwestern Asia, consists mainly of lowland which increases in elevation from southeast to northwest. Located between the Persian and Arabian highlands, this lowland contains the famous Tigris and Euphrates Rivers, which wind their way from northwest to southeast through the entire length of the country and finally empty their waters into the Persian Gulf. In the middle and lower courses of these river valleys the gentle gradient and generally flattish charac-

[1] There is an old adage to the effect that grass dies under the Turkish hoof.

ter of the adjacent land facilitate widespread floods, especially following the period of winter rains.

Though productive and densely populated in ancient times, many parts of Iraq at present contain but few people; and much of the land has become lowland waste. This has been associated mainly with the abandonment of irrigation projects, the waters subsequently spreading out in the form of unhealthful marshes. At present, however, steps are being taken to reclaim some of this land.

The alluvial materials of lowland Iraq have weathered into relatively fertile soils, but these have in many places become waterlogged because of the abandonment of irrigation projects and therefore neglect of flood-water control. It is believed that the fine silty character of the soil adds to the difficulty of reclamation of this land.

The extreme northern part of the country consists of a rugged highland in which the upper tributaries of the Tigris have cut deep channels. As a physical feature this region continues northward into Anatolia and Persia, and the general area where these three countries—Anatolia, Persia, and Iraq—meet is commonly called Kurdistan.

Climate and vegetation.—Similar to other parts of southwestern Asia, Iraq consists essentially of desert and steppe. In fact, much of this kingdom receives less than 10 inches of rainfall per annum, the average at Bagdad being 7.05 inches. Moreover, because of its zonal location between the tropics and subtropics, Iraq has high temperatures practically the whole year round. Evaporation of moisture is therefore rapid, and a given amount of rainfall is less effective than it is in middle latitudes. Under these climatic conditions the native vegetation consists mainly of various kinds of xerophytic grasses and shrubs. Even in the waterlogged river lowlands, grasses prevail; and without irrigation the land in general is suited only for the grazing of livestock.

A land of winter rain.—Like the Mediterranean region of Europe, Iraq receives its precipitation chiefly during the winter half-year, the summer season being practically rainless

(Fig. 41). This winter precipitation is associated with the passage of low pressure areas that originate over the Mediterranean and Black Seas and pass from west to east over the northern part of Iraq.[2] Moisture laden winds are drawn into

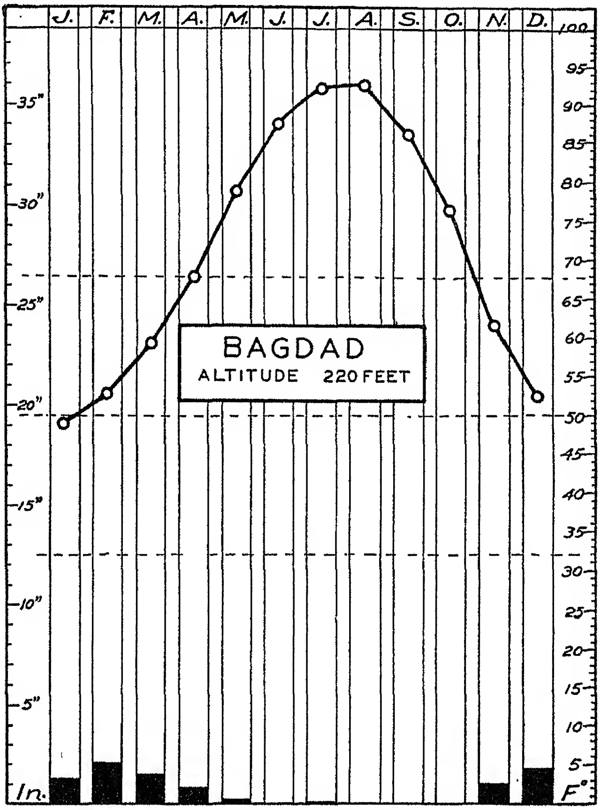

Fig. 41.—Average monthly temperature and rainfall records at Bagdad. Note the mediterranean rainfall regime.

these lows from the Persian Gulf and lose some of their moisture in the lowlands of the country, the northern highlands receiving a relatively larger amount of precipitation. As the low pressure areas move eastward the wind changes, giving rise to southwest winds[3] that frequently blow with consider-

[2] Kendrew, W. G.: *The Climates of the Continents,* The Clarendon Press, Oxford, 1922, p. 153.

[3] These are called Suahili by the natives.

able violence and make the coastal waters of Persia dangerous for small vessels.[4]

Hot, rainless summers.—Absolute desert conditions are found in Iraq during the summer half-year. The heat is intense. Temperatures frequently rise above 100°F., with a record at Bagdad of 123°F. In fact, Iraq is one of the hottest areas on earth during the summer season. The sensible temperatures, however, are relatively low, being reduced to a marked extent because of the dry air and the northwest wind. The inhabitants frequently take refuge in underground caverns and chambers during the hottest hours of the day.[5]

Importance of agriculture.—In the fertile alluvial soils of this arid and semi-arid land, agriculture constitutes the chief source of wealth, and is indeed basic in the national economy of the 3,300,000 people of Iraq, yielding the chief items of export.

Irrigation agriculture.—Iraq's natural environment favors the development of irrigation. Here the arid and semi-arid climate with its high temperatures and rapid evaporation suggests the necessity of irrigation before crops can be grown; and indeed without irrigation most of the land is suitable only for the grazing of sheep or other animals capable of picking a living on dry, short grasses. The Tigris and Euphrates Rivers, rising in the better watered highlands northwest of Iraq, provide an abundance of water; and the level land facilitates the development of irrigation projects as well as the cultivation of the soil. Yet in spite of these factors favoring the development of irrigation agriculture, less than eight per cent of the area of Iraq is under cultivation, a fact which is largely explained in the history of the country.

The early history of Iraq discloses a constant struggle for supremacy between contending nations. Yet the country remained prosperous until it was conquered by the Arabs. As the inhabitants were driven from their lands, the greater ir-

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[4] Kendrew, W. G.: *The Climates of the Continents,* The Clarendon Press, Oxford, p. 153.

[5] *Ibid.*

rigation works were neglected. The waters of the rivers and canals, no longer controlled, spread out into wide marshes. What the Arabs commenced, Turks, Mongols, and Tartars completed, and one of the most fertile regions of the earth was abandoned to nomads.

At present, attempts are being made to restore ancient canals and develop new areas. The water is pumped from the rivers and their tributaries by oil pumps—a practice that is favored by the local supply of petroleum. Such pumps are being installed in increasing numbers, and in 1930 Iraq possessed approximately 1,960 of these machines.

The rapidity with which irrigation enterprises develop depends in large measure upon the financial position of the country. Recently work has been limited by inadequate funds, despite the growing need for an extensive system of agricultural development.

Irrigation between the rivers.—Although the Tigris and Euphrates Rivers follow the same lowland in their course southeastward to the sea, the velocity, and therefore the carrying capacity of these streams, varies at different points. This variation in stream velocity affects quite directly the flowage of irrigating waters between the two rivers. For example, the Tigris is a fast river in its upper and middle parts, and therefore carries its silt; whereas the slower Euphrates begins to deposit its load a little below the Aleppo-Mosul line; and in the lowland opposite Bagdad the latter river is 25 feet above the general land level (Fig. 42). Thus, water for irrigation can be distributed in canals by means of gravity from the Euphrates to the lower level of the Tigris. But nearer the sea the Euphrates flows over a gulf that has been filled with Tigris sediment, the latter river being at a higher level in this part of Iraq. Here the movement of waters for the purpose of irrigation is from the Tigris to the Euphrates.

Irrigation and flood control.—An extensive system of irrigation and flood control has been suggested, but its cost is regarded as too great under the present financial position of the country. An important start, however, was made in 1924,

when a concession was granted for the development of large areas of land along the Euphrates and Dialah rivers.[6]

The world's leading producer of dates.—Iraq leads all countries in number of date palms and in the commercial production of dates. In fact, of the estimated number of date trees in existence, Iraq has one-third, or approximately 30,000,000, trees; and it is believed that Iraq produces approximately three-fourths of all the dates of commerce.

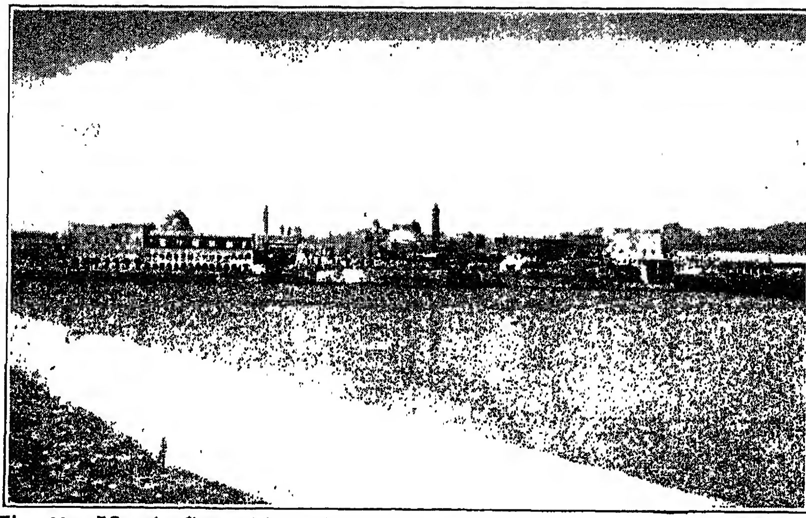

Fig. 42.—Mosul—Central Mosul, from the stone approach to the Old Bridge. A high stage in the Tigris. (Courtesy of Near East Foundation.)

The date trees of Iraq are found mainly in the lower part of the country, one-half of them (15,000,000 trees) being located on the Shatt-al-Arab. Among other important areas are the districts in the vicinity of Bagdad, the lowlands of the Euphrates River, and scattered oases in various parts of the country.[7]

Along the Shatt-al-Arab there is irrigation of a distinctive character. The rising tide causes the waters of the distribu-

[6] Bureau of Foreign and Domestic Commerce: *Commerce Reports* (Oct. 14, 1929), Washington, D. C., p. 79.

[7] Popenoe, Paul: "The Distribution of the Date Palm," *The Geographical Review*, Vol. XVI (1926), p. 117.

taries to back up and to overflow their channels. Thus the land is inundated each day; and the date palm, which grows well even in a somewhat saline area, receives abundant supplies of moisture. This region constitutes Iraq's largest area of date cultivation.

Other crops.—In addition to the cultivation of the date palm the peasants of Iraq grow a variety of crops, the most important of which are barley, wheat, rice, citrus fruits, cotton, and tobacco. In normal years barley is one of the chief cereal crops and constitutes an important item of export. Wheat is exported in smaller quantities, the larger portion remaining for home consumption. Cotton growing has been gradually developed during recent years, but the exportable surplus is still relatively small (approximately 3,000 bales of 400 pounds each). Licorice root is one of the crops of Iraq. It is not cultivated, but is grown wild along the banks of streams.[8]

Most of the country's rice is grown in scattered irrigated districts between Basra and Bagdad, whereas wheat and barley are most widely cultivated in the upper part of the Tigris and Euphrates valleys, where large amounts are produced without the aid of irrigation.

Mineral production: petroleum.—Like most of its neighbors, Iraq is not an important producer of minerals. Some interest, however, has developed in the oil fields of northeastern Iraq, chiefly near the Persian border. With a production of 1,100,000 barrels of petroleum in 1933, Iraq was a minor producer of this commodity. But a tremendous project has been completed (January 1935) which within a short time will enable Iraq to rank among the ten leading producers of petroleum. This project consists of a 1,150-mile transdesert oil pipeline system, which extends from Kirkuk, Iraq to the Mediterranean Sea. On the Mediterranean it will have two terminals —one at Tripoli, Syria, and the other at Haifa, Palestine. As the largest pipe line project ever attempted in oil fields outside the United States, it was designed and built by American,

[8] Bureau of Foreign and Domestic Commerce: *Commerce Reports* (Oct. 14, 1929), Washington, D. C., p. 79.

British, and French engineers; and it will serve Standard Oil, Anglo-Persian, Royal Dutch, and the Compagnie Francaise des Petroles.[9]

Other minerals.—Among other minerals are gold, lead, copper, platinum, and zinc in northern Iraq. Salt and gypsum are more widely distributed and are used locally. Some coal, chiefly of low grade, is found in several areas. But in the exploitation of all these minerals Iraq holds a very low place among the nations of the world.

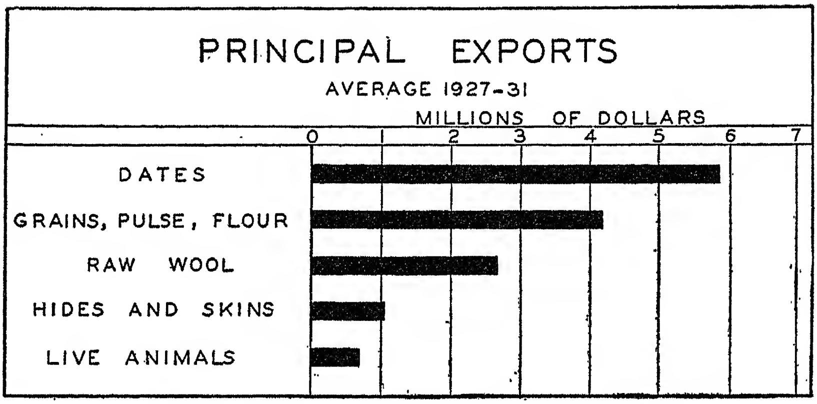

Fig. 43.—Diagram showing the chief exports of Iraq.

Little manufacturing.—Owing to a lack of almost all the conditions which cause manufacturing to grow, industries have developed slowly; and indeed such manufactured goods as the people use are mainly imported. The local manufactures are confined chiefly to small establishments, most of which lack modern equipment. These include cotton ginning, knitting, spinning, shoe manufacturing, preparing sheep casings, flour milling, and oil refining. The latter industry has developed rapidly in recent years with the increasing exploitation of the petroleum resources, and gives promise of continued growth. Most of the oil, however, is sent out of the country to be refined.

[9] Willson, C. O.: "Iraq Crude to Become Factor in World's Market," *Oil and Gas Journal*, Vol. XXXII (1933), p. 71.

Foreign trade.—The foreign trade of Iraq is small, the total of all exports and imports for 1930 being $42,700,000, or only three per cent as large as that of the small European country of Belgium. In addition, the trade statistics of Iraq disclose an unfavorable balance of trade, the imports normally exceeding the exports in value. It is believed, however, that the adverse balance is offset to a considerable extent by invisible exports, among which are payments for services rendered

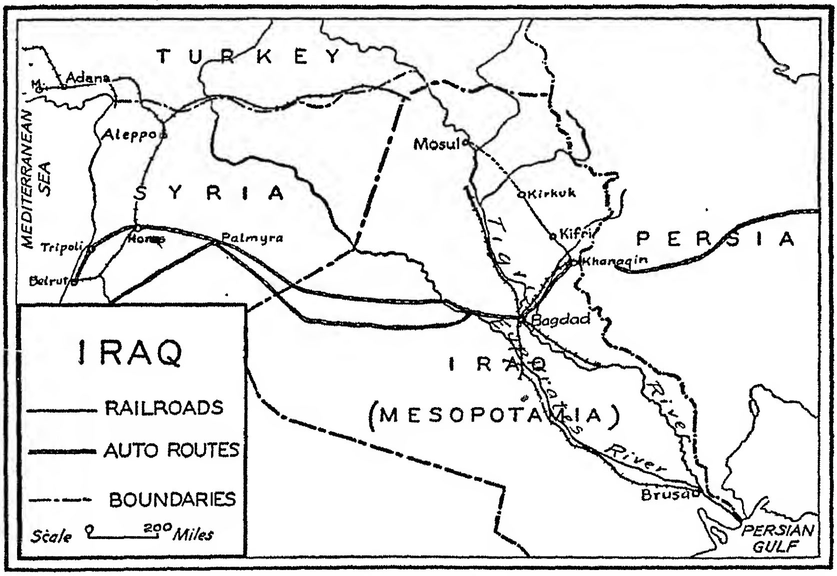

Fig. 44.—Map of Iraq showing railways, auto routes, and chief cities.

in transit trade and expenditures for salaries and supplies in the development of Iraq's petroleum industry.[10]

Leading items of export now consist of dates, grains, raw wool, hides and skins, and live animals (Fig. 43).

Railways, waterways, and auto routes are used in transporting materials of domestic production to the coastal districts (Fig. 44). Further economic development of the country will be associated with the increase of rail and road mileage.

[10] Bureau of Foreign and Domestic Commerce: *Commerce Reports* (Oct. 14, 1929), Washington, D. C., p. 81.

PERSIA (IRAN)

Distinguishing characteristics of Persia.—Second in size in southwestern Asia, Persia (recently named Iran) contains approximately 628,000 square miles of land, or more than the combined area of Germany, France, and Spain. Among the countries of southwest Asia it is therefore second only to Arabia in size, and like those countries it is relatively sparsely populated. Its 10,000,000 people, 90 per cent of whom can neither read nor write, are unevenly distributed, the greater densities being found along the coastal areas of the Persian Gulf and Caspian Sea as well as in the various interior oases and trade centers. The uneven distribution of the population is indeed a reflection of the greater opportunities for economic development in some areas than in others, and the large patches of sparsely populated land attest the highland and dry land character of much of Persia. The population is engaged mainly in agriculture, and approximately 20 per cent of the people are pastoral nomads.

As part of southwestern Asia, Persia contains features which characterize that division of the continent—a commingling of desert, steppe, and oases. Here the precipitation is in general most abundant in winter, and occurs in the form of snow in the highlands. After flowing down the mountain slopes the Persian streams sink into the porous limestone rocks, which are widespread in the plateaus of the country. Here the streams concentrate in narrow underground channels, called kanats and karizes, flow considerable distances, and finally either become extinct in the arid lowlands or reappear in piedmont areas and plains where they have given rise to the development of irrigation agriculture. Many of these narrow channels, however, are artificial, and from remote antiquity the natives of Persia have been great practical irrigators.

The physical features.—Like other parts of southwest Asia, Persia consists chiefly of highland. It comprises the larger part of the Iranian Plateau, which lies between the lowlands of Mesopotamia and the Indus Valley. The largest mass of

high land is located in the southwestern part of the country (Fig. 45). Here the mountain ranges trend in general from northwest to southeast, with peaks rising about 10,000 feet. But mountains are found also in the northern part of the country, the Elburz ranges located south of the Caspian Sea being noteworthy. Located between the various mountains of the country is the large arid highland area with its interior system of drainage. Indeed, of Persia's 628,000 square miles of land, approximately 330,000 square miles drain into the interior. Here some of the streams lose themselves in the desert,

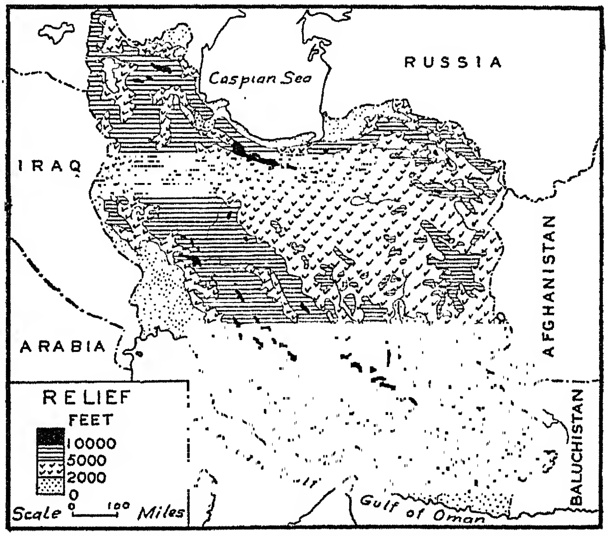

Fig. 45.—The highland character of Persia is a noteworthy feature of this diagram. (Altitudes according to J. Paul Goode.)

others form inland lakes and swamps. Most of the remaining land of Persia drains into the Caspian Sea and Persian Gulf.[11]

Climate.—Typical of other parts of southwest Asia, most of Persia has an arid and semi-arid climate. The precipitation varies from an annual average of 12 to 14 inches along the region of the Persian Gulf, as at Bushire, to only three inches at Isfahan, located in the interior. Irrigation agriculture and

[11] It is estimated that 135,000 square miles of Persia drain into the Persian Gulf and Gulf of Oman, and 100,000 square miles drain into the Caspian Sea.

pastoral nomadism are therefore important. The only part of Persia that has an average annual precipitation of more than 40 inches is the area south of the Caspian Sea, especially the northern slopes and foothills of the Elburz Mountains.

Like the Mediterranean lands to the west, Persia is under the influence of low pressure areas, which pass from west to

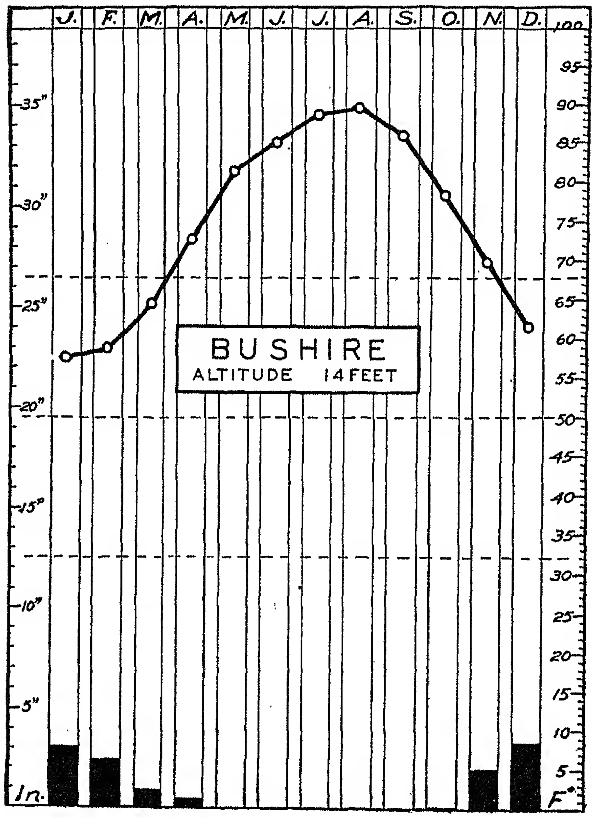

Fig. 46.—Average monthly temperature and rainfall at Bushire, Persia. Note the mediterranean rainfall regime.

east across the northern part of the country during the winter season (Figs. 46 and 47). Precipitation is frequently associated with the passage of these lows. But during the major part of the year the wind blows from the north. The air therefore moves from higher (colder) to lower (warmer) latitudes

and its moisture-holding capacity is increased. Moreover, the air currents move from higher to lower altitudes before they reach the interior of Persia, which therefore explains in part the aridity of the interior plateau (Fig. 47).

During the summer half-year the winds blow almost incessantly from the north, especially over the northern three-

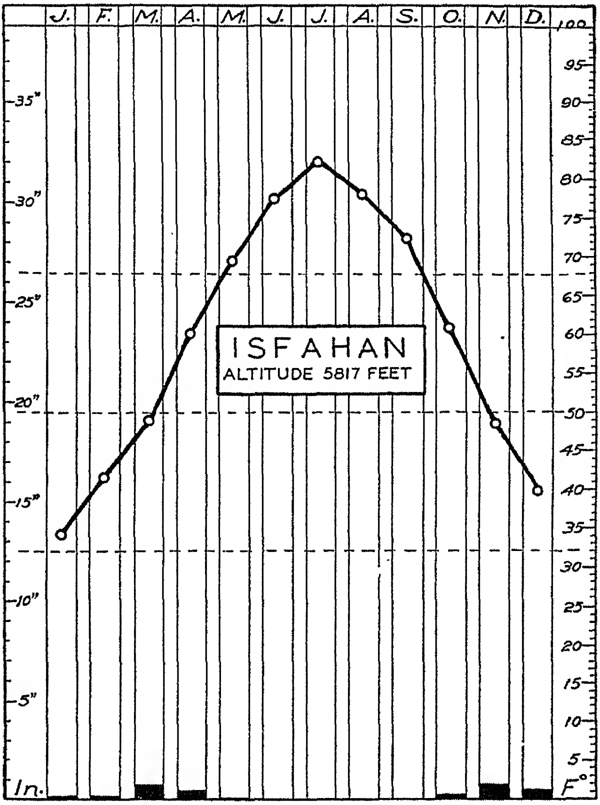

Fig. 47.—Temperature and rainfall records during the year at Isfahan, Persia. This inland station has a desert climate.

fourths of Persia. Mention is sometimes made of the wind of 120 days, which blows with considerable violence in some parts of the country, reaching a velocity of more than 60 miles an hour. This wind, sometimes called the Shamal, carries dust far out over the Persian Gulf. During July the coastal

region of the Gulf of Oman is under the influence of the southwest monsoon.

Temperatures vary considerably from one part of Persia to another. They vary from lowland to highland and from south to north. In general, the relatively cloudless interior of the country has the greatest seasonal and diurnal range. Here both insolation and radiation are rapid, and here the thermometer sometimes registers more than 100°F., especially during July. In winter the temperatures of the interior frequently fall below the freezing point, and sometimes even below zero.

Irrigation.—In this arid and semi-arid country, in which the dry season lasts seven to eight months, irrigation is essential for maximum crop returns. The Caspian zone indeed is the only major area of Persia with a climate sufficiently humid for the production of a variety of crops without irrigation, though even there irrigation is required for the production of rice during the summer season. Along the Persian Gulf there is also some production of wheat and barley by means of dry culture (fallow farming).

The type of irrigation varies from place to place in Persia, but there are two kinds that predominate: (1) the open canal system, and (2) the use of kanats or subterranean aqueducts that unite water of several springs and conduct their combined volume to the surface at lower levels.

The system of kanats is the most important in Persia. Under this system water is conducted through underground channels from the better watered highland slopes to the adjacent lower, level lands, where it is distributed at the surface for irrigation purposes. In some of the smaller inclosed basins the kanats extend outward like the spokes of a wheel from the center of the basin into the adjacent highlands. In the construction of these subterranean channels, wells are sunk at intervals of approximately 20 years—and in some places as deeply as 100 feet—these being subsequently walled up and covered on the top with stone and dirt. The latter is indeed the only outward manifestation of these artificial under-

ground channels; and the wells have been compared with the manholes in the conduit system of our modern cities, but they are utilized in obtaining water from the underground channels.[12]

In some places the kanats are numerous, and where they come together towns have grown up. Among these are: Yezd, located amid fields of intensively cultivated plants; Isfahan, with its grain fields; and Shiraz surrounded by well-cared-for gardens and fields of grain.

Irrigation in the Seistan depression.—The Seistan depression, a significant low part of the Iranian Plateau (2,000 feet in elevation), is found where the Helmand River pours out its last waters in what may once have been a lake. This depression comprises a region in which Persia meets the two neighboring states of Afghanistan and Baluchistan, and extends over into the latter political units. Her irrigation agriculture early reached a high state of development, and the large grain production of the region caused it to be known as one of the granaries of Asia. But in the fourteenth century the Seistan depression was invaded by the Mongol chief, Tamerlane, who destroyed one of the largest irrigation projects, an injury from which the region apparently has never recovered.

By reason of the extreme aridity of the Seistan depression, irrigation agriculture is essential for crop production. Without irrigation the land is in part waste, in part pasture. Much of the irrigated land is located on and adjacent to the delta which the River Helmand has built in this arid region. One of the distinguishing features of the system of irrigation found in this area is that canals have been so constructed in some districts that they cross each other on bridges. These bridges have been made from dried weeds pressed down in water and coated with clay.[13]

Agriculture.—Like other countries of southwest Asia, Persia is essentially agricultural. Agriculture is indeed the chief

[12] For an excellent description of the kanats see Fisher, Commodors: "Irrigation Systems of Persia," *Geographical Review*, Vol. XVIII (1928), p. 303.

[13] Carrier, E. H.: *The Thirsty Earth*, Christophers, London, 1928, p. 101.

source of wealth, and agricultural products constitute approximately 70 per cent of all exports. Yet Persia is not a significant world producer of agricultural commodities, mainly because of: (1) the relatively primitive agricultural methods and the low per-acre yields; (2) the low purchasing power of the masses; (3) the illiteracy of the people, this being estimated at 90 per cent of the total population; and (4) the limits imposed by the environment, such as the limited extent of land available for irrigation.

Of the various cereal crops, wheat, rice, barley, and millet are the most widely cultivated. Other selected agricultural commodities from the standpoint of total amount produced are cotton, tobacco, dates, apricots, and raisins.

By reason of Persia's zonal location in a subtropical area, winter as well as summer (saifi) crops are grown. Wheat, barley, and peas are normally grown as winter crops, being sown after the sun-baked ground has been loosened by the first showers of autumn. For these crops the period of planting usually lasts from November to the first part of January. On the coastal lands the season of harvest is usually during April and May for both wheat and barley. Among the summer crops, rice, cotton, millets, beans, and tobacco are most important.

Wheat, the most widely cultivated cereal.—Of the cereals, wheat is grown in all parts of the country, the average annual production being more than 40,000,000 bushels. Since it is grown during the rainy season, which is also the cool period of the year as well as the time when evaporation is least rapid, it is generally produced without the aid of irrigation. Rice, on the other hand, requires irrigation, even in the more humid lands located south of the Caspian Sea, where 89 per cent of Persia's rice is grown. Twenty per cent of the rice crop finds a market in Russia, the remainder being consumed within the country. In addition, the coastal lands of the Persian Gulf import rice from India, and this mainly because rice may be obtained more cheaply from India than by means of the

poor transportation from the lands adjacent to the Caspian Sea.

Cotton production increasing in importance.—As a producer of cotton, Persia has shown some progress within recent years, the average annual production for 1925-1930 being 104,000 bales of 500 pounds apiece. The chief commercial production of this commodity is found in the area of the Caspian seaboard, where the Russian market absorbs more than 90 per cent of the exportable surplus, most of the remaining 10 per cent being sent to India. Since the Persian cotton consists chiefly of the short staple varieties, it commands a relatively low price. It does not compete with American cotton in the markets of western Europe.

The importance of wool.—The raising of sheep is an important occupation in Persia, the pastoral nomads constituting approximately 20 per cent of the total population. Wool is therefore an important agricultural commodity. The requirements of this industry are indeed so large that considerable quantities of wool are imported from adjacent lands.

Other agricultural products.—Fruit and nuts are widely grown in Persia. Of these, almonds, grapes, apricots, and dates are most important. It is estimated that Persia contains approximately ten million date trees, most of which are found in two regions: (1) adjacent to the Shatt-al-Arab of Iraq, and (2) the Minab district located near Bandar Abbas.[14] Practically all the dates that are exported (more than 40,000 tons) find a market in the British Empire. On the other hand, the raisins are sent mainly to Russia (approximately 25,000 tons). In contrast with dates, vineyards are found chiefly in the interior of Persia, being essentially lacking in the area of the Persian Gulf.

Future of agriculture.—There is ample room for the development of agriculture in Persia. In most places wheat yields only 10-fold and rice 15-fold, whereas the latter, in certain

[14] Popenoe, Paul: "The Distribution of the Date Palm," *Geographical Review*, Vol. XVI (1926), p. 117.

districts, grown under favorable conditions has given a yield of 60-fold. Deeper plowing is one of the requirements for larger crop returns; and this cannot be accomplished with the rough hewn wooden plows, which seldom make furrows more than three or four inches in depth. Other agricultural implements are also primitive in character. Hand sickles are used in reaping, and the grain is trodden out from the straw by the work animals, as of old. Furthermore, some of the land is owned by absentee landlords, who show but little interest in the development of their holdings; and the prevalent hand labor methods of farming give large returns per acre, but not per man. Hence, the great masses of Persian peasants generally lack the necessary capital to buy large-scale, labor-saving machinery.

Mineral resources.—Although Persia contains a variety of minerals, among which are oil, gold, silver, copper, tin, zinc, mercury, nickel, iron, antimony, and manganese, only oil is exploited in large quantities. The lack of exploitation of the metals is due mainly to the poor transportation, the distance from markets, and the paucity of coal for smelting purposes. In addition, the reserves of high grade ore are small and there is urgent need for better mining methods.

The exploitation and refining of petroleum at present is the most important of all mineral industries of Persia. It not only employs a large number of people, but the value of petroleum products constitutes the most important item of export. In the production of crude petroleum, Persia indeed holds a conspicuous place, ranking fifth among the nations of the world (Fig. 48).

The development of the petroleum industry of Persia dates from 1901, when Great Britain succeeded in making negotiations with the Shah and obtained control of the chief oil lands of the country. The British concessions are at present in the hands of the Anglo-Persian Oil Company, whose chief area of exploitation is located in western Persia, not far from the border of Mesopotamia.[15] The oil is pumped from the

[15] Chiefly near the city of Shushtar.

fields to the refineries and shipped to the British Isles or to the British oil-burning vessels that operate on the Mediterranean trade route.

Manufactures.—As has been stated, Persia is primarily a country of pastoral nomadism and agriculture, manufactures being of secondary importance. Persian industry is greatly handicapped by the backwardness of the country. Capital is lacking; transportation is difficult and costly since the country

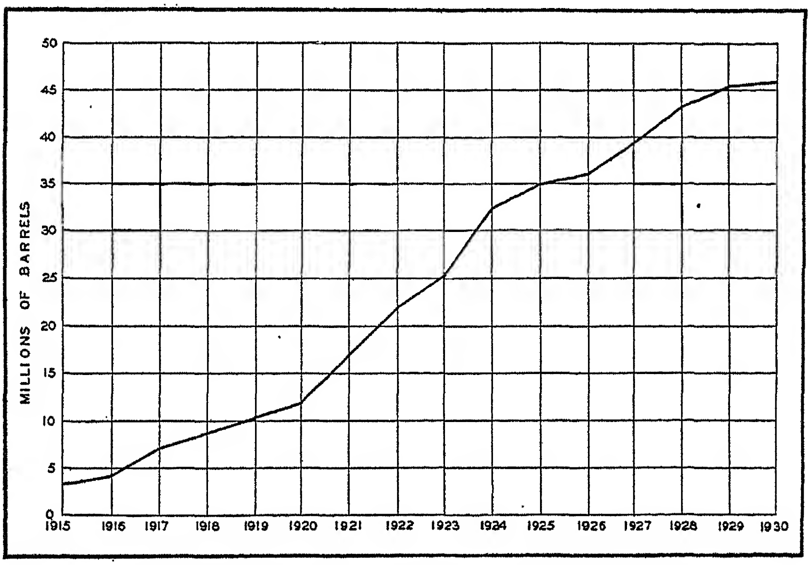

Fig. 48.—The production of petroleum in Persia since 1915.

has a paucity of good roads and railroads; and the people in general are ignorant of modern methods. Under these conditions, hand manufactures for local consumption have been carried on for hundreds of years, the only commercial commodities produced in large quantities being the famous Persian rugs and carpets.

The rug industry.—Rug making not only occupies the time of many people, but the finished product constitutes one of the important exports of the country, of which the United States normally takes one-half (Fig. 49). The labor engaged

in the manufacture of these rugs consists chiefly of women and girls, some of whom make the rugs in their respective households. But this practice has gradually given way to organized industry centering in the Persian towns and cities. Modern machinery is generally lacking, and the average rug-making establishment may be thought of as merely a collection of looms under one roof. Here the women and girls are employed on the piece-work basis, the raw material being

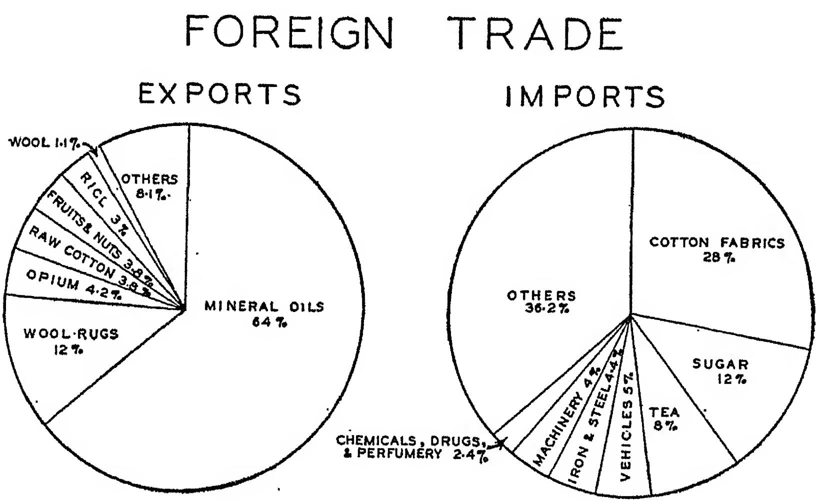

Fig. 49.—The exports and imports of Persia.

supplied by the manufacturing establishment. Great care is taken in the making of these rugs to give them the qualities for which they have become noteworthy in the commercial world.[16]

Textile industry.—Textile manufacturing is widespread in Persia. It is essentially a cottage industry; and hand looms are found in almost every home in the rural districts, since the poor people cannot afford to buy the imported cloth. In fact, Persia contains only one cotton cloth factory, this being located at Tabriz.

[16] The raw material used in their manufacture is obtained mainly from wool, but also from mohair and hair clipped from the yak, Tibetan goat, and camel.

Other manufactures.—Aside from the refining of oil and the making of rugs, other manufactures of Persia are of relatively minor importance. A match factory has been established at Tabriz, but this at present suffers from Russian competition. Others include furniture making in northwest Persia and brass works at Shiraz and Isfahan.

Transportation.—In most parts of Persia modern transportation facilities are lacking, and the cost of moving commodities from place to place is therefore exceedingly high. The poor status of the country in transportation is reflected in part by the small railway mileage, the total amount of which was only 230 miles in 1930. In fact, Persia has fewer miles of railway line per square mile of land than has any other country recorded in the Commerce Yearbook of the United States. But some progress is being made, especially the construction of the Trans-Persian Railroad, a line that is destined to extend from the Persian Gulf to the Caspian Sea via the centers of Hamadan and Teheran.

Wherever better roads have been built, motor truck transportation has been stimulated; and this has gradually taken the place of animal caravans on the principal routes. Although the cost of transport by animal caravans continues to be much lower than by motor truck, the increasing quantity of freight has resulted in reduction of rates to a level where the time saved in motor transport shipment has placed it on a competitive basis with the slow caravan service. But the natural environment still favors the caravan travel in many areas, especially during the rainy season (winter).[17]

Commerce.—The foreign trade of Persia has increased from a total value of $44,000,000 in 1901 to $168,000,000 in 1930. This increase has been due mainly to the increasing development of oil production. Nearly all the petroleum is exported to the British Isles. It is mainly due to the large total value of petroleum and petroleum products that Persia's exports normally exceed her imports, whereas the country had an

[17] Bureau of Foreign and Domestic Commerce: *Commerce Reports* (July 15, 1929), Washington, D. C., p. 146.

adverse balance of trade before the time of large scale commercial production of petroleum (Fig. 50).

The foreign trade of Persia is conducted mainly with the United Kingdom, Egypt, Russia, India, and the United States. The United Kingdom and Egypt take most of the country's petroleum and petroleum products. Russia imports large quantities of Persia's cotton and fruit; and the United States

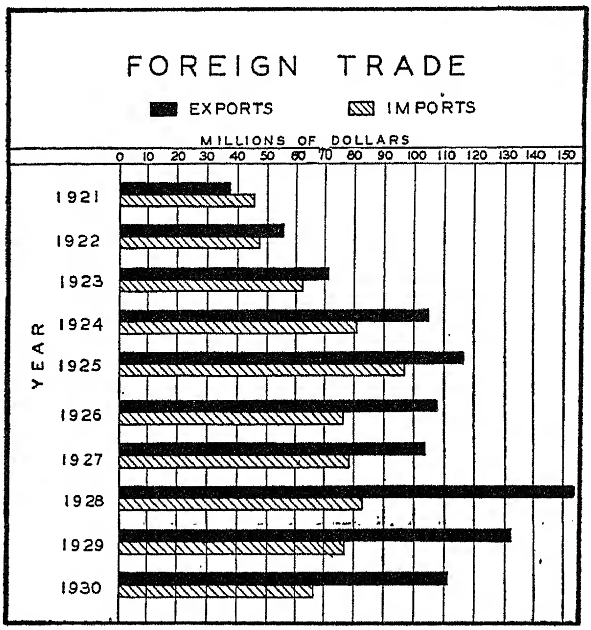

Fig. 50.—The foreign trade of Persia since 1921. Note the excess of exports over imports.

constitutes the chief market for Persia's rugs, taking more than half of all exports of that commodity within recent years. Egypt, though an important market for Persian goods, is of little importance in supplying the country with commodities.

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CHAPTER X

Other Units of Southwestern Asia

SYRIA

Distinguishing characteristics of Syria.—Located south of Turkey and embracing 60,000 square miles of land, Syria is an independent state under the mandate of France. It is essentially a highland area, being a part of a large ancient block of land of which Arabia also forms a part. Like Turkey to the north, Syria's climate varies from the mediterranean type on the west to steppe on the east; and economic activities therefore also vary from place to place, from intensive agriculture in the coastal districts and in the oases to pastoral nomadism in the arid interior. Like Palestine to the south, Syria's history is noteworthy. The country constituted the home of the Phoenicians and contains a number of historically important cities, among which are Damascus, Tyre, Sidon, Palmyra, and Aleppo.

The population and economic activities.—Syria contains approximately 2,800,000 people, of whom 1,500,000 are Moslems. The population density is therefore 47 per square mile. But the density is not uniform throughout the country. Thus, Phoenicia and the Lebanon coastal districts are densely populated, as well as some of the fertile interior valleys and oases. On the other hand, the higher mountains, arid leeward slopes, and pastoral grasslands contain but few people per unit area. In general the population density is high (1) in areas favorably located for the development of trade and (2) in areas where intensive agriculture is practiced.

Economic activities and the natural environment.—Since agriculture is the most important major economic activity

and the chief source of wealth, it determines more than any other human occupation the distribution of the population of Syria. But agriculture in turn depends upon the opportunities and handicaps of the natural environment.

One of the major factors influencing economic activities is relief. This varies considerably in Syria, the land rising sharply from the Mediterranean to altitudes of more than 6,000 feet above sea level. Farther east, beyond the highest

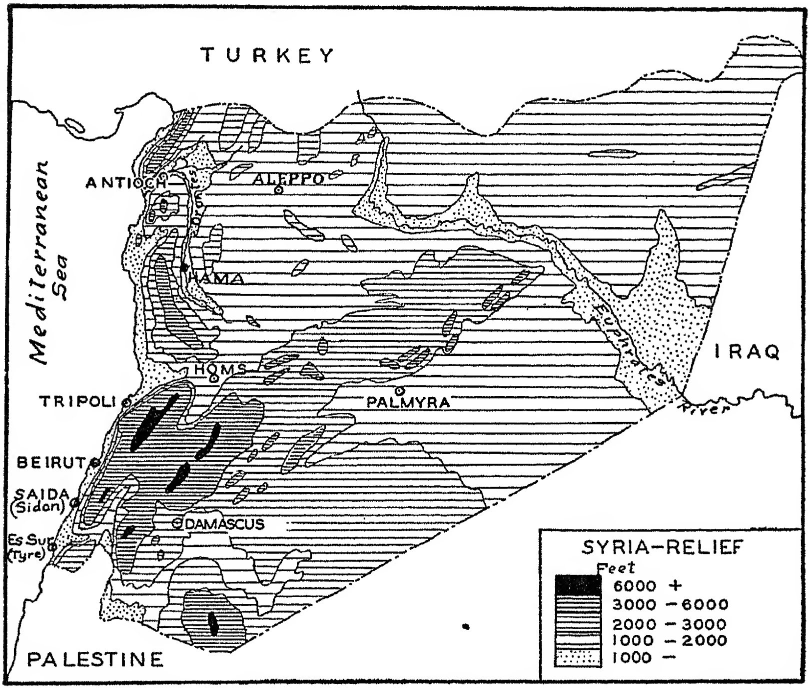

Fig. 51.—The relief of Syria.

mountain ranges, the land slopes downward into a series of long steps to the basin of the Euphrates (Fig. 51).

One of the marked characteristics of the surface features of Syria is their north-south direction, which coincides in general with the major zones of fracture. Thus, from west to east four distinctive physical units may be recognized: (1) the coastal plains; (2) the western highlands; (3) the central de-

pression; and (4) the eastern arid plateaus and plains.

Although narrow, the coastal plain of Syria is an important part of the country. It contains the area known as "Ancient Phoenicia." Here are located some of the most important citrus fruit, olive, and grape producing districts; and here are the important ports, including the ancient maritime centers of Sidon and Tyre (Fig. 52). The coast, however, is quite regular or uniform. It contains but few indentations, and therefore has only a few natural harbors. One of these is Beirut, which is located on the northern shore of a promontory.

Fig. 52.—The ancient harbor of Tyre. (Courtesy of Near East Foundation.)

The land rises with distance eastward from the coastal plains to the highlands of Lebanon, Jebel, Nuseiriye, and the Amanus Mountains; whereas east of these highlands, it descends into a major north-south trending depression. Located in the northern part of this depression, the Orontes River follows a major line of fracture northward to approximately 36° N. latitude, turns sharply to the west, and empties into the Mediterranean Sea.

Irrigation agriculture.—In Syria various systems of irrigation are found. In some places diversion irrigation is prac-

ticed, in other places water is obtained from wells. In still other districts intensive cultivation is made possible by means of water wheels containing wooden buckets which lift the water and deposit it in stone aqueducts from which it flows to the surrounding crop lands. At Hama, located on the River Orontes in northern Syria, there is a giant water wheel which is believed to be the largest of its kind in the world, measuring 70 feet in diameter. At Damascus, that ancient seat of culture and eloquence of the Arab world, a diversion system of agriculture is followed. Here the Barada River, obtaining its waters from the highlands of Anti-Lebanon, forms a number of distributaries, the waters of which are led into canals and lateral ditches giving rise to one of the most distinctive oases of the Old World, long renowned for its orchards of figs and apricots.[1]

Northern Syria.—As a major geographical division, northern Syria is noteworthy chiefly because it functions as a land of transit. It contains the Orontes River, which, together with its tributaries, provides easy gradients from the Mediterranean coast to the interior part of the country. Caravan routes from Iraq and Armenia have long made use of this northern region, following the Euphrates Valley, which extends far to the west in this part of Syria. One of the most important of the trade routes of this part of Asia is the one which extends from Aleppo, over the Amanus Range by way of the Beilan Pass, to Alexandretta. Still another route follows the Orontes River to its mouth.[2]

An east-west cross section of the region shows poorly drained lowlands in the lower part of the Orontes River. Malarial infested swamps and moorlands are found in some districts. The better drained lands are devoted to grain and cotton fields as well as olive and fig orchards. The highlands which border the Orontes Valley have an abundant rainfall on the windward, western exposures (40 to 50 inches a year), and

[1] Carrier, E. H.: *The Thirsty Earth,* Christophers, London, 1928, p. 105.

[2] Ashton, Bessie L.: "The Geography of Syria," *Journal of Geography,* Vol. XXVII (1928), p. 169.

relatively small amounts of precipitation on the eastern slopes. Orchards of olives and fruit trees constitute an important part of the cultural landscape of the highland regions.

Farther to the east the Aleppo tableland, with its rolling land surface, is broken in places by basalt ridges and rock-covered hills. Here fields and pastures alternate, the latter gaining at the expense of the former as one proceeds toward

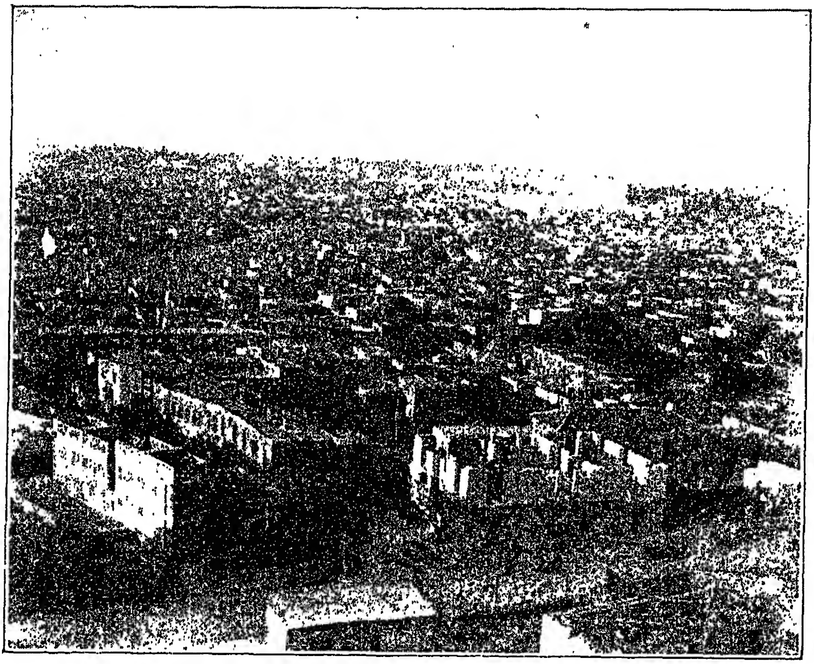

Fig. 53.—Aleppo, Syria. (Courtesy of Near East Foundation.)

the southeast by reason of the decrease in precipitation in that direction. Grain fields, olive orchards, and vineyards occupy the cultivated land, whereas the pastures are utilized by nomads who travel from place to place with their flocks of sheep and goats.

The leading commercial center of the region is Aleppo, a city favorably situated with respect to major trade routes (Fig. 53). It handles the products of the adjacent agricultural districts as well as those of the grasslands. Important

commodities in this trade consist of wool, sheep's butter, licorice, olive oil, lambskins, hides, and dried fruits. Local industries have developed within the city, and include the making of soap, embroidery, leather working, and the weaving of silk goods.

Central Syria.—Central Syria extends from the Mediterranean coast eastward to the Euphrates Valley (Fig. 51). It contains the cities of Hama, Homs, and Palmyra. As a major geographical division, central Syria has relatively more arid and semi-arid land than may be found in the northern region of the country. The coastal ranges, which are located between the Orontes River and the Mediterranean Sea, constitute an effective barrier against the moisture-giving winds from the west. Thus, central Syria is mainly a sparsely populated steppe land in which nomads find pasturage for their livestock. During the spring of the year, Bedouin tribes from the Euphrates Valley and other districts farther east come into the region in order to find pasturage for their livestock and markets for their surplus goods.

The chief cultivated lands of the region are located on the highland slopes in the west and in the lowlands which are open to the west. One of these lowlands contains the city of Homs. Here the moisture bearing westerlies find a break in the highland wall of western Syria and make possible crop production without the aid of irrigation.

Farther to the east the land is occupied by pastoral nomads. This dry eastern part of central Syria contains the well-known ancient city of Palmyra, in the ruins of which Tadmor has been built. Located along the edge of a low plateau, Palmyra developed as a significant center of trade.

Southern Syria.—The conspicuous physical features of southern Syria are the high mountains of Lebanon, Anti-Lebanon, and Mt. Hermon, together with the plain of Damascus farther to the east. The important cities of the region are Tripoli, Beirut, Saida (Sidon), Es Sur (Tyre), and Damascus (Fig. 51).

Along the western, windward slopes of Lebanon and Anti-

Lebanon intensive agriculture has made possible many densely populated communities. The crop land is given to wheat, olives, vines, and the mulberry. Still farther west, on the narrow Mediterranean coastal plain, citrus fruits (lemons and oranges), cereals, and olives are the chief types of agricultural production. On the other hand, to the east of the highlands the land is arid by reason of the double barrier of Lebanon and Anti-Lebanon, which places this region in a leeward position with regard to the moisture bearing winds. In this

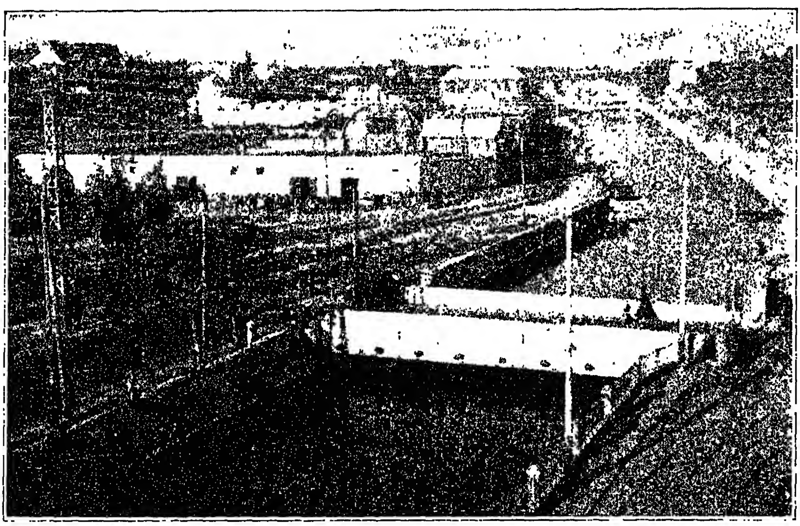

Fig. 54.—Approaching Damascus. (Courtesy of Near East Foundation.)

leeward area and below the slopes of Anti-Lebanon lies the plain of Damascus, which receives its life-giving waters from the Barada River. This plain supports not only Damascus, but approximately eighty small villages. Irrigation agriculture characterizes the plain, which is one of the chief garden spots of the country.

As one of the oldest cities of the world, Damascus has a favorable geographical location for the development of trade (Fig. 54). From it important trade routes radiate outward and connect the city with widely separated centers, such as Bagdad, Alexandria, and Mecca.

CYPRUS

Situation and size.—Cyprus, an island located in the eastern end of the Mediterranean Sea approximately 60 miles west of Syria, is especially important as a strategic base for Britain. This island extends approximately 140 miles from east to west and embraces an area of 3,584 square miles. In comparison with other Mediterranean islands, it therefore ranks in size next to Sicily and Sardinia, but is larger than Corsica or Crete. Its population density of approximately 100 people

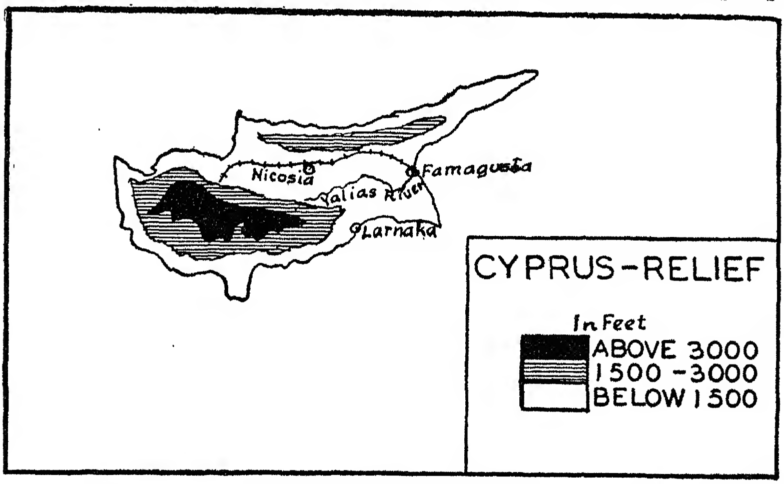

Fig. 55.—Relief of Cyprus.

per square mile of land is less than one-fourth that of Sicily.

Relief and climate.—The relief map shows two major highland areas extending in a general east-west direction (Fig. 55). The northernmost of these—the Kyrenai highland—is structurally an offshoot of the Taurus Range of Anatolia. The southern highland—the larger of the two—rises to altitudes of 6,400 feet, and is a relatively significant area from the standpoint of the island's pastoral activities. Between these highlands lies the central plain, a lowland which stretches from the east coast to the west coast and constitutes the most important physiographic division of the island.

The climate of Cyprus is greatly modified by relief. In summer the plains are hot and dry, whereas the mountains

are cool and receive a greater amount of precipitation, especially on their windward slopes. Like other Mediterranean areas, the island has a distinctly seasonal precipitation, characterized by winter rain and summer drought.

Irrigation.—The light rainfall over most of the cultivated land of the island makes the problem of irrigation relatively important. Yet irrigation has been practiced on a limited scale because of the lack of streams from which water may be readily diverted to the land. In recent years (1929-30), however, the Government has made extensive investigations for subsoil water, and wells have been dug in many areas. Wells drilled in 1929 and 1930 produce approximately 2,604,000 gallons of water a day. Additional water may be obtained in the hills of Kyrenia in the northern part of the island.

Agriculture predominates.—In Cyprus agriculture is the chief source of economic wealth. Crops cover a large part of the land, and approximately 65 per cent of the people are employed in agricultural pursuits. The leading products include carobs or locust beans, potatoes, raisins, barley, wheat, olives, and citrus fruits.

In addition to crop production, the livestock industry is an important phase of agriculture in Cyprus. Like other parts of the Mediterranean Basin, the island contains large numbers of sheep and goats—animals capable of picking a living on the relatively scant pastures found in these areas during the summer half-year.

Forest and mineral exploitation.—The forests of Cyprus embrace approximately 400,000 acres and constitute almost one-fifth of the total area of the island. They are most widespread in the rugged highlands of southern Cyprus. As in other Mediterranean lands, the forests have been greatly depleted. However, through a progressive government policy, reforestation is taking place as rapidly as funds permit.

Mining is relatively important, and mineral products play a prominent role in the island's export trade. The principal minerals include asbestos, copper ore, gypsum, terra umbra, and chrome.

Manufactures and commerce.—The manufacturing industry of the island is relatively unimportant. Among the chief products of this industry are cigarettes, brick and tile, gypsum, wine, silk, soap, and cheese. In addition, fine embroidery and needlework constitute products of the home industry.

The total foreign trade of Cyprus is small, amounting to approximately $9,000,000 in imports and $7,000,000 of exports. Yet the per capita trade is greater than that of other Mediterranean areas such as Spain, Italy, Jugoslavia, or Greece.

The United Kingdom is not only the chief customer of Cyprus, but it is also the main source of imports. The remaining foreign trade of the island is confined chiefly to countries located about the eastern Mediterranean Basin.

TRANS-JORDAN

Physical setting.—As a territory under British Mandate, Trans-Jordan extends eastward from the Jordan Valley into the arid realm of Arabia. It contains approximately 20,000 square miles and 300,000 people.

Physically, the country consists of a mountainous plateau, the altitude of which varies from 1,500 to 4,500 feet above sea level. The mountains of Gilead, Moab, and Edom, which are located in the western part of the plateau, rise to elevations between 4,000 and 5,000 feet. Deep ravines intersect the highlands in many places. On the west the plateau terminates with the abrupt edge of the rift valley which contains the Jordan River, the Dead Sea, and Wadi Arabia. Eastward the highlands of Trans-Jordan merge gradually into the arid limestone and flint lands of the Syrian Desert.

The climate consists chiefly of desert and steppe. The more humid lands are found in the northern and western parts of the highlands. Here are located the chief forests and cultivated lands. In the remainder of the country, grasses and brush predominate. Winter rain and summer drought characterize the distribution of precipitation in Trans-Jordan.

Occupations.—Most of the people of Trans-Jordan are Arabs who are engaged in pastoral activities and as agricul-

turists. The majority of the latter may be considered sedentary agriculturists; that is, people who live in fixed, permanent houses; whereas most of the pastoral people are nomads who do not cultivate crops but depend primarily on their herds, travelling from place to place in search of pastures. However, there is also an intermediate group, which may be classified as semi-nomadic. The workers of this group cultivate crops, keep livestock, live in tents, and preserve certain tribal characteristics.

The most fertile agricultural lands of the country are located in the Jordan Valley and in the western highlands. In the western part of the plateau a belt of cultivated land trends from north to south, decreasing in width towards the south until it finally ceases entirely.

AFGHANISTAN

Physical framework.—With an areal extent of about 245,000 square miles, Afghanistan is mainly a rugged highland country. In the northeast and north-central parts, the Hindu Kush Mountains, a continuation of those of northwestern India, constitute a sparsely populated highland complex which offers essentially nothing to the commercial world. South of these highlands, and comprising the large central interior, Afghanistan contains another extensive highland region known as the Hazara, which also is sparsely populated. Along the eastern edge of the highlands the land drops from Afghanistan to the Indus lowlands of India. Here deep valleys have been formed, and low saddles and passes form breaks in this mountain complex. One of these deep valleys is occupied by the famous Khyber Pass, which is located on a feeder of the Kabul River. In this eastern region of Afghanistan the Kabul River has developed a great complexity of feeders. The lowlands of this area, served by the city of Kabul, constitute the best developed and most densely populated units of the country.

In the northwestern part of Afghanistan lies a region which is drained by the upper branches of the Amu Darya (Oxus River). The region is known as Bactria or Afghan Turkestan.

Like Russian Turkestan, it has a dry climate and may some day take advantage of the opportunity of developing irrigation agriculture. Flanking Afghan Turkestan on the east and comprising the extreme northeastern part of the country, the isolated highland region of Badakshan forms one of the well-defined physical units of Afghanistan.

The south and southwest of Afghanistan include the desert of Registan as well as the Seistan depression, which extends over the border into eastern Persia. Here a few valleys, chiefly that of the Helmand River, constitute narrow ribbons of fertility in the desert.

Climate.—The climate of Afghanistan is characterized by diversity and extremes. Climatic diversity is generally found in rugged highland regions. The extremes are well illustrated by the records taken from various parts of the country. Thus in the north the winter temperatures frequently drop to 12 or 15°F. below zero, whereas the shade temperatures in summer are as high as 110 to 114°F. Extremes of cold are experienced every winter in the vast highland interior part of the country. Even in the east, at Kabul, a blanket of snow frequently covers the ground for two or three months.

Afghanistan receives its precipitation mainly during the winter half-year. Only the extreme valleys that lead from Afghanistan down into the Indus Plains of India enjoy the rains of the southwest monsoon. For the country as a whole, the summers are dry. Winter snowfall and spring rains are associated with winds that come from the west and northwest.

Agriculture.—Diversity of climate and of relief is matched by a variety in agriculture from place to place in Afghanistan. In most parts of the country two harvests are realized—one in early summer, the other in autumn. The crops harvested in early summer are usually fall-sown, and consist chiefly of wheat, lentils, and barley. They are common winter crops of the Orient; in Afghanistan they are called the "baharak." The crops harvested in autumn are usually sown during the preceding spring. They are summer crops of the Orient, called the "paizah" or "tirmai" by the Afghans. The chief summer

crops of the country are rice, sorghums, millets, maize, tobacco, and tubers. Of these, rice is grown chiefly where irrigation can be practiced. It is therefore not so widely distributed as wheat, sorghums, and millets. In the eastern part of the Hazara and Hindu Kush highlands a large part of the crop land is devoted to bajra, a crop that is also grown to a large extent on the Deccan Plateau of India.

The arid climate of most parts of Afghanistan suggests the need for irrigation agriculture. Artificial watering of crops is practiced in many districts, and two well defined systems may be recognized. In the eastern mountain valleys, such as the Kabul Valley, open canals similar to those of northwestern India are the chief type. On the other hand, in the southwest desert, in the Seistan depression, the irrigation works are similar to those of the neighboring country, Persia. Here the subterranean aqueducts or kanats unite the waters of highland springs and streams and conduct their combined volume to the surface at lower levels.

The widely distributed pastures of rugged highlands and arid plains constitute the grazing grounds of various kinds of livestock, the most important of which are sheep, one-humped camels, two-humped camels, and humped cows. The last are kept for milk in the arid southwestern part of the country. Sheep are widely distributed in the rugged highlands, whereas the two-humped camels are found in the north.

Forest and mineral resources.—The great degree of relief and the variety of physical conditions combine to give the country a varied flora. Thus the lower slopes of the mountains facing the desert of the southwest have a scanty cover of vegetation. In the interior and northern mountains, at elevations of 6,000 to 10,000 feet, Afghanistan has large forest trees, of which the conifers are most important. At lower elevations these highlands contain acacias, wild olive, species of rock rose, willow, poplar, and ash. The mulberry is cultivated in some districts.

The chief minerals of Afghanistan are gold, iron ore, gypsum, and coal. Iron ore occurs in the Hindu Kush Mountains,

gypsum is found in the plain of Kandahar, and gold is taken from the streams of the mountain valleys.

Industries and commerce.—The most distinctive industries of Afghanistan are those which depend upon local sources of raw materials; such as, wool, goats' hair, skins, and raw silk. Thus typical industries are the making of felts, carpets, silks, coats, and clothing. Still other industries are engaged in processing foodstuffs.

The foreign commerce of Afghanistan is very small. Since densely populated communities are located in the eastern highlands adjacent to India, as at Kabul, foreign commerce has long taken place across the Indian border. From India, Afghanistan obtains cotton goods, hardware, and implements in exchange for dried fruits, timber, drugs, wool, hides, and silk. The southern and southwestern parts of the country trade with Persia. The small extent to which other foreign countries are affected by the foreign trade of Afghanistan is suggested by the fact that the commerce of the country is not listed in the Commerce Yearbook of the United States Department of Commerce.

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Part III

THE INDIAN REALM

CHAPTER XI

The Natural Environment of India

Distinctive features.—As a geographical base for human development, India intrigues the interest of peoples in all parts of the world. The country contains one of the four major human agglomerations, and possesses population groups that differ strikingly in race, language, culture, and religion. The population density also varies from place to place and reflects the opportunities and handicaps imposed by the physical equipment of the country. Diversity of soil, climate, native vegetation, and relief of the land is matched by diversity in economic life. With a climate that ranges from desert in the northwest to the highest average recorded rainfall for the world in the Khasia Hills of the northeast, India shows a striking diversity in its agricultural life, the latter being the dominant occupation of India's teeming millions.

Influence of the country's location.—India projects southward as one of the three major peninsulas of southern Asia. It bridges the space between the semi-arid southwestern Asia and the moist rice-producing and rice-exporting lands of southeastern Asia. It therefore occupies a central position between distinctly different areas. It is also located along the great Mediterranean trade route to the Far East, and is thereby favored in making trade connections with distant lands. It is, however, flanked on the north by the highest mountains on earth; and by reason of its location south of this barrier, India is shut off from direct and widespread contacts with inner Asia. But this large barrier, backed by the extensive and high Tibetan Plateau, is an advantage climatically, since it shuts India off from the cold air currents that flow outward from central Asia during the winter season. In-

deed, it causes tropical climatic conditions to prevail well beyond the thirty-fifth parallel of north latitude.

A large, densely populated country.—By reason of its vast extent, India is sometimes called a sub-continent. It contains approximately 19 times as much cultivated land as Australia, and one of the major human agglomerations of the world (See Figure 5). Here 350,000,000 people live on an area of land covering 1,800,000 square miles,[1] approximately three-fifths the size of the United States. The main part of this area comprises somewhat roughly in outline the form of an equilateral triangle, each side of which is almost 2,000 miles in length. Most of this land is known as the British Provinces, and the remainder consists of many native states.

Physical framework of India.—Although India contains a great diversity of land surface, it may be divided into three major physical divisions. These include: (1) the peninsular area of southern India; (2) the Indo-Gangetic Plain; and (3) the mountainous northwestern, northern, and northeastern parts.

The triangular southern part of India comprises a plateau, called the Deccan. It increases in altitude toward the west, and is rimmed on its seaward sides by mountains (Fig. 56). The mountains flanking the western part of this plateau are called the Western Ghats; those skirting the eastern edge are the Eastern Ghats. Of these two mountain systems the Western Ghats form the higher, more distinctive barrier. They are steep-sided, terraced highlands with an average elevation of approximately 3,000 feet.

The Deccan Platèau consists in part of old crystalline rocks, which constitute the roots of a higher more extensive land area, and in part of basaltic rocks formed by fissure eruptions in the geological past. These basaltic formations at present cover approximately 200,000 square miles, a unit quite com-

[1] These figures include Baluchistan with its 54,000 square miles of land and 420,000 people, and Burma with its 233,000 square miles of land and 14,665,000 people. Baluchistan is similar to other parts of southwest Asia; it has therefore been discussed with that unit. Similarly, Burma is part of the peninsula of Indo-China.

parable in physical structure and in size with the Columbia Plateau of northwestern United States. It is this area of basalt or trap[2] formations which at present comprises the geographical base for some of the most extensive cotton lands of India. On the other hand, the areas of crystalline rocks north and south of the basalt have weathered into relatively less fertile soils.

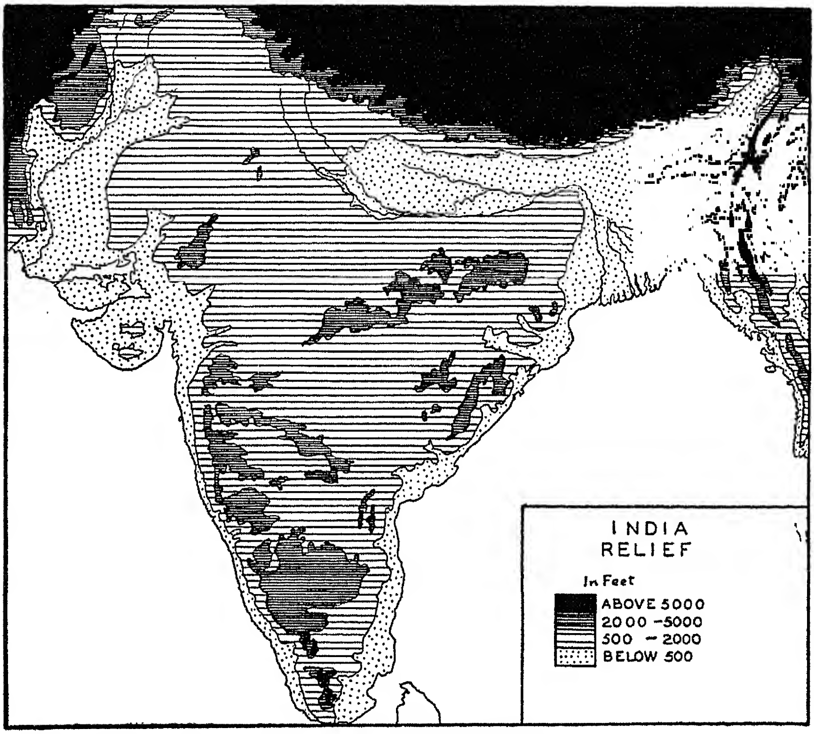

Fig. 56.—Relief of India.

North of the Deccan Plateau lies the Indo-Gangetic Plain. It stretches from the Arabian Sea and Baluchistan on the west to the Bay of Bengal and Burma on the east. It is flanked on the north by the Himalayas. It contains the drainage basins of the Indus, Ganges, and Lower Brahmaputra Rivers. This extensive plain is level and free from stones and pebbles.

[2]This term is derived from the Swedish word "trap," meaning step.

It consists of areas of recent alluvium as well as old alluvium. Here the dense agricultural population attests the suitability of the area for crop production (Fig. 57). Indeed, in some parts of the Indo-Gangetic Plain the population density is more than 550 people per square mile of land.

The massive mountain barriers which trace the northern

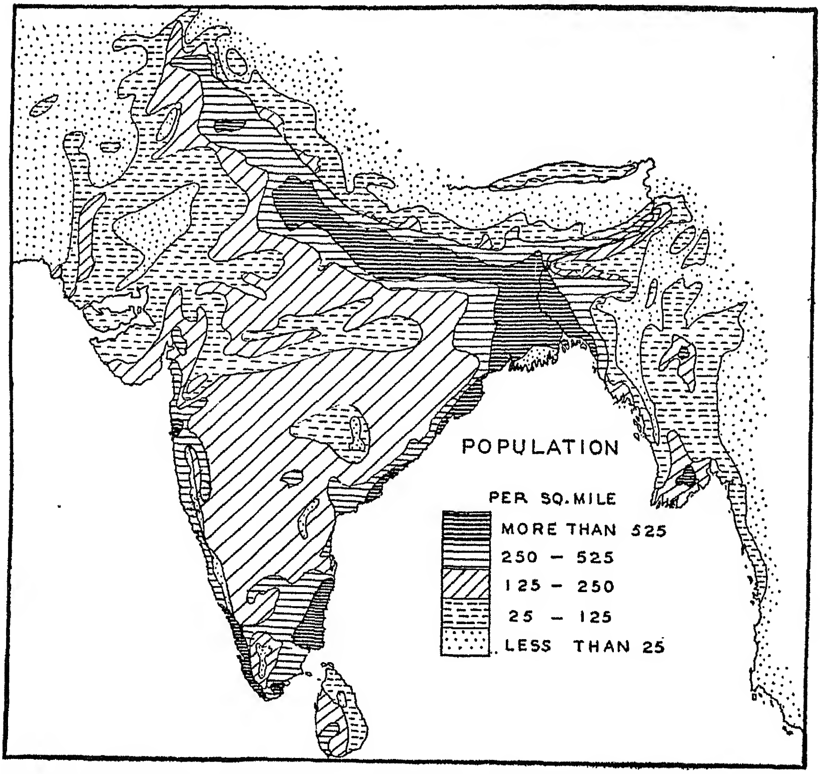

Fig. 57.—Population distribution map of India. Note the densities in the Ganges Valley and in the well-watered coastal districts.

edge of the plain exclude easy contacts with inner Asia, and thus help to maintain the economic and social solidarity of the plain. Access is possible only where breaks occur in the mountain wall or where low saddles afford a passageway. The Khyber and Bolan passes in northwest India have acquired significance as channels through which peoples have moved throughout historic times. Although they constitute a bar-

rier to the free movement of goods and ideas, the mountains of northern India have a moderating influence on the temperature and humidity of the Indo-Gangetic Plain. They wring much moisture from the monsoon winds that ascend their southern slopes—moisture which is carried by streams to the adjacent plains. Moreover, by reason of their altitude,

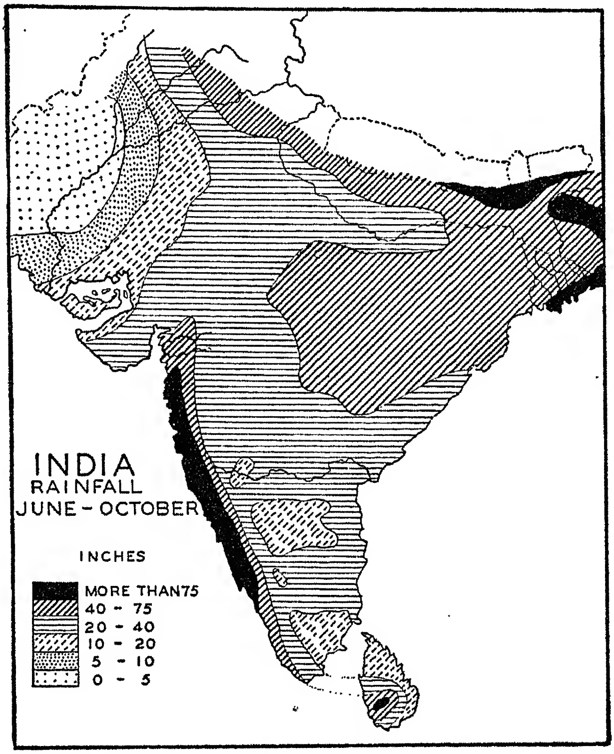

Fig. 58.—Average rainfall in India during the period June to October. (After Climatological Atlas of India.)

and therefore lower summer temperatures, they constitute a refuge for European people living in India.

Influence of the monsoon.—India receives its precipitation during the summer half-year. Moisture therefore comes at the time of high temperatures and when plant growth is at its maximum. This is not the case in most mediterranean lands, where the rain falls chiefly during winter. But the rainfall varies in amount and distribution from time to time. In

years when the monsoon rains come later than usual, the rainy season is in many places not long enough to mature the crops.

The precipitation of India varies greatly from place to place. Indeed, a low latitude desert covers a part of northwest India and the greatest rainfall in the world has been recorded at Cherrapunji, a station situated in the Khasia Hills

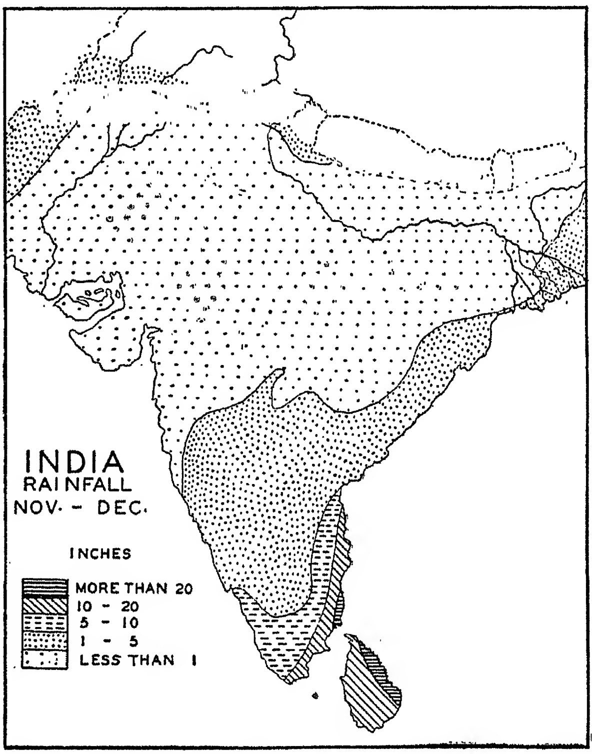

Fig. 59.—Average rainfall in India during the period November and December.

of northeast India. But most of India receives approximately 30 to 40 inches of rainfall per annum, and over large areas the precipitation is just sufficient for crop production (Figs. 58 and 59). Any deviation below normal causes crop failures and sometimes widespread famines.

Climate and human energy.—In India the year may be divided into four seasons—the cool season, the hot season, the season of rains, and the season of the retreating summer mon-

soon. Here the cool season, or the time of the winter monsoon, is the most invigorating period of the year. At that time the sky is most free from clouds; the sunshine is intense; the humidity of the air is low; and very little rain falls. The lower temperatures and humidity make the sensible temperatures lower than during the other seasons of the year. But the season following (spring) is oppressive; for then the air currents are less intense, owing to the shift in the monsoon. Thus during the spring of the year the air is stagnant and oppressive; the temperatures are higher and the moisture content of the air is greater than that of the winter monsoon; hence the sensible temperatures are higher.

Climates and famines.—The chief disadvantage of the rainfall regime of India is its uncertainty. Years of abundant rainfall are interspersed with years of drought; years of feast are broken by periods of famine, which is due to the varying intensity of the monsoon, resulting in years of deficient, excessive, or irregular distribution of rainfall. The large land mass of Eurasia, apparently owing to the fluctuation in solar weather, is heated with different degrees of intensity, with a resultant variation in the intensity of the monsoon.

In a country like India, where agriculture is the dominant activity and the dense population presses upon the means of subsistence, periods of erratic rainfall shake the economic foundation of the land, and often millions of people perish.[3] Famines have been especially severe in those parts of the country in which the rainfall is just sufficient for crop production, and any deviation below normal usually means crop failure and starvation. On the other hand, in those areas which receive an abundance of precipitation, especially accessible lowlands, and in districts where year-round canal irrigation is practiced, famines have seldom been experienced. In general, therefore, famines are most severe in the interior parts of the Deccan, especially in areas remote from lines of transportation. Famines,

[3] There are evidences from the ancient literature of the Hindus that famines have occurred in India from the earliest times. Since Warren Hastings introduced British rule there have been more than twenty severe famines.

however, are less severe at present owing to the development of perennial irrigation, the construction of transportation lines to various parts of the country, and the increased planning supported by government action. The government prevents the excessive export of grains until after the succeeding monsoon has shown whether or not there will be crop failure; hence there have been no widespread famines in India within the last few decades.

Climate as related to population density.—In a nation which depends primarily upon agriculture, a close relationship exists between the density of population and the abundance of rainfall. This relationship is strikingly disclosed in India, as is shown by a comparison of the population and rainfall of the country, chiefly summer rainfall (Figs. 57 and 58). The heavily shaded areas, that is, the regions which have abundant rainfall, are also areas of dense population. Similarly, the lightly shaded areas of small rainfall coincide in general with those areas which are sparsely populated.

Diversity of soils.—Soil scientists state that climate and vegetation are the chief factors in causing major differentiation among soils (mature soils). Since India contains a climate in which the rainfall varies from the greatest on earth to that of the desert, and a vegetation that varies from heavy forest to desert bunch grass, the soils likewise vary greatly from place to place.

In general, where mature soils are found, they belong to the non-lime-accumulating soil division.[4] But many of the Indian soils can not be considered mature, hence they bear a close similarity with the underlying parent material. This is especially true of soils that have developed in the Indo-Gangetic Plain of northern India. Here are two main types of agricultural lands: (1) areas of old alluvium found farther up stream and back from the water courses; and (2) the districts of recent alluvium.

In the Deccan Plateau the two major types of rocks—

[4] Non-lime-accumulating soils are soils that do not contain a zone of lime-carbonate accumulation somewhere in the mature-soil profile.

granitoids and basalts—constitute strikingly different parent material in which soils have developed. The basaltic formations have weathered into the well-known black soils of the Deccan, and these at present constitute the geographical base for some of the most important cotton lands of India. Yet various studies indicate that the black soil or regur is not con-

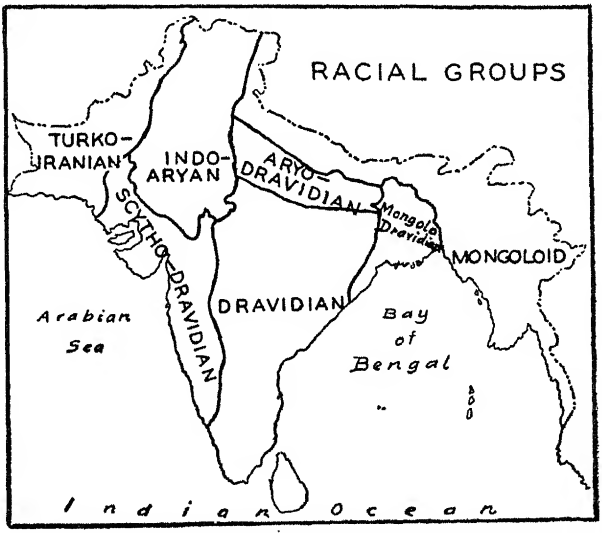

Fig. 60.—Major racial groups in India. (After Risleys: *The People of India.*)

fined to the areas of basalt. On the other hand, the soils which have developed in the regions of crystalline rocks are generally more sterile than the soils of the Black Belt.

Cultural, religious, and linguistic diversity.—It is difficult to understand the national economy or interpret the status of economic activities of India without considering various nongeographical factors. Throughout historic time India has been marked by diversity in culture, religion, and language (Fig. 60). Indeed, in no other equal area in the world is there found a population of more than 350,000,000 people divided to such an extent into distinct and independent communities.

Religion plays a very important part in the lives of the people of India; and especially significant is the fact that it sometimes divides the people into separate and even hostile

communities. Hindus and Moslems living side by side often view one another with suspicion and antagonism, which frequently results in physical conflict, and this to the detriment of economic development.

The caste system is another factor which acts as a detriment to modern industry. In some cases members of one caste

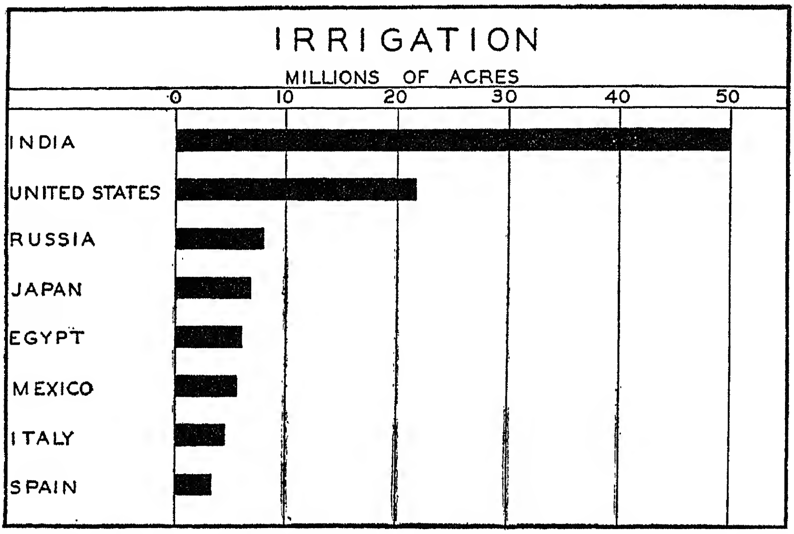

Fig. 61.—Diagram showing the amount of irrigation in various countries (exclusive of China).

are not permitted to touch objects which have been touched by those of a lower caste. Moreover, the refusal of members of different castes to work together and the restriction of certain castes to do certain kinds of work promote economic waste and inefficiency. At present, however, there is a tendency toward the adoption of ideas and practices more in accord with those of our Western civilization.

Modern industry demands intelligent workers, a condition which does not prevail in present-day India. It is estimated that there are less than 25,000,000 out of India's 350,000,000 people (less than 1 per cent) who are literate in any language, and only 2,500,000 who can read and write English. This condition is further aggravated by the great number of languages. Indeed, there are more than 120 vernacular languages in India.

Irrigation and agriculture.—In no other country in the world is irrigation so widely practiced as it is in India. Here approximately 50,000,000 acres of land are under irrigation as compared with 26,000,000 acres in the United States (Fig. 61). The most extensive irrigated areas of India are found in the Punjab, the United Provinces, Madras, and Bihar and Orissa. In general these provinces receive scanty (15 to 20 inches) to moderately abundant precipitation (40 to 50 inches).

The development of irrigation works in India, largely through Government initiative and operation, has shown considerable progress and is one of the most encouraging factors in the economic progress of the country.

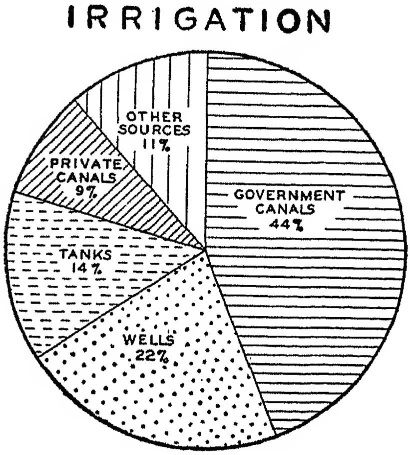

Fig. 62.—Diagram showing proportion of irrigated land in India and the Indian States obtaining water from various sources.

Types of irrigation.—The type of irrigation that is practiced represents an adjustment to conditions of rainfall and relief. Some areas of low relief and moderately abundant precipitation require only a small additional amount of water in order to obtain maximum crop yields. In such areas the ground water level is often sufficiently high so that the small amount of irrigation water may be obtained by the use of wells. That is a common practice on the low-lying alluvial soils in the western part of Bengal and in the Middle Ganges region where wells are a conspicuous feature of the cultural landscape. Like the tanks of the Deccan of India, wells may be considered "indigenous irrigation works," which in general are operated without aid or assistance from the government authorities (Fig. 62).

Precipitation decreases with increasing distance up the Ganges Valley. Moreover, the land becomes higher above sea level, with the water table farther from the surface; and therefore water is obtained with greater difficulty. In addition, since the precipitation is less in the Upper Ganges region, water must be supplied in greater quantities. Hence the perennial diversion type of irrigation takes the place of wells. Indeed, when the lowlands of the Punjab (the five-river country) are reached, the traveler sees only the perennial diversion system of irrigation, with its numerous main canals and laterals extending from the chief streams. These streams, rising in the better-watered highlands to the north, provide a continuous supply of water throughout the year.

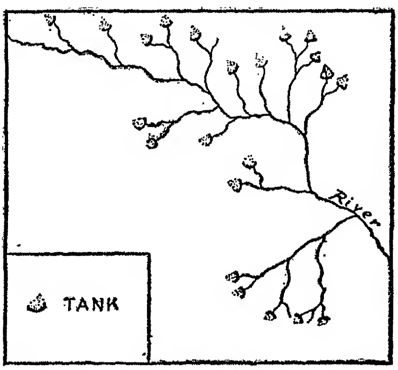

Fig .63.—Sketch map showing tanks as they occur in river basins in many parts of the Deccan.

In the lower part of the Indus Valley, south of the Punjab, inundation irrigation is practiced. In this type of irrigation the water of the river is impounded, thereby inundating the lowlands and providing a moist seed bed in which to plant crops. Thus the production of rice is made possible in the Lower Indus Valley, a region with a desert climate.

Throughout vast stretches of rugged land in the Deccan of India tanks are used for storing water. Some system of irrigation is necessary in this region of uncertain rainfall. Here the irregularities of the land surface provide depressions which are readily dammed for the storage of water. These are often located at the headwaters of streams (Fig. 63). In many places, especially in the Province of Mysore, river basins contain a large number of tanks made possible by the construction of earthen embankments at various places in the basins, the surplus water of the tanks located at higher elevations feeding the ones that are nearer the mouth of the river.

Tank irrigation has various advantages, among which the following are noteworthy: (1) It constitutes one form of protection against a markedly seasonal and uncertain rainfall. (2) It enables the growth of a greater number of crops during the year. However, the fact should be emphasized that all of the tanks of the Deccan are dry during the hot season (March to May) and some have sufficient water for but one crop. (3) Tank irrigation favors the rise of the subsoil water level and is, therefore, beneficial to well irrigation. In fact, in the Deccan Plateau of India a large proportion of the wells are dependent upon the tanks and without tank irrigation would become dry.

Tanks are most numerous in the eastern part of peninsular India, chiefly in Madras Presidency, and they are relatively important on the black or regur soils of the Deccan Plateau. Madras has approximately 70,000 tanks, of which 50,000 serve crop areas of less than 50 acres each. The soil units of the latter are chiefly the reddish colored silts, sands, and loams. On the other hand, the black or regur soils of the Deccan cover the basalt or trap formations, but are not entirely confined to the latter rocks, as various studies have indicated. This black soil is retentive of moisture and quite generally rests on an impervious substratum. In many districts it has a tendency to crack, and therefore requires an abnormally large quantity of water. In other areas the great moisture-holding capacity of the regur favors irrigation by wells rather than by means of tanks. Moreover, the region of basalt sheets, where the regur is most widespread, has a surface structure that is quite unfavorable to the construction of many small tank irrigation

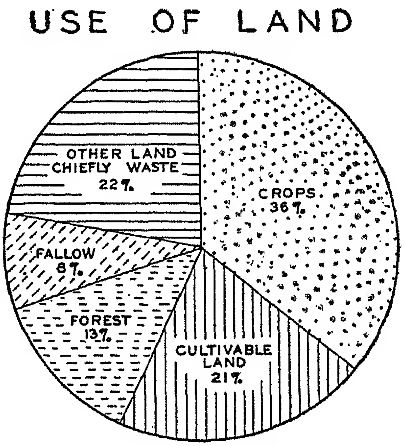

Fig. 64.—The use of land in India. The diagram includes the Indian States as well as British India. (Based on data obtained from Agricultural Statistics of India, Department of Intelligence and Statistics, Calcutta, India, 1930.)

works. Here the term "trap" is suggestive of the giant step-like edges of the extensive sheets of basalt which cover the region.[5]

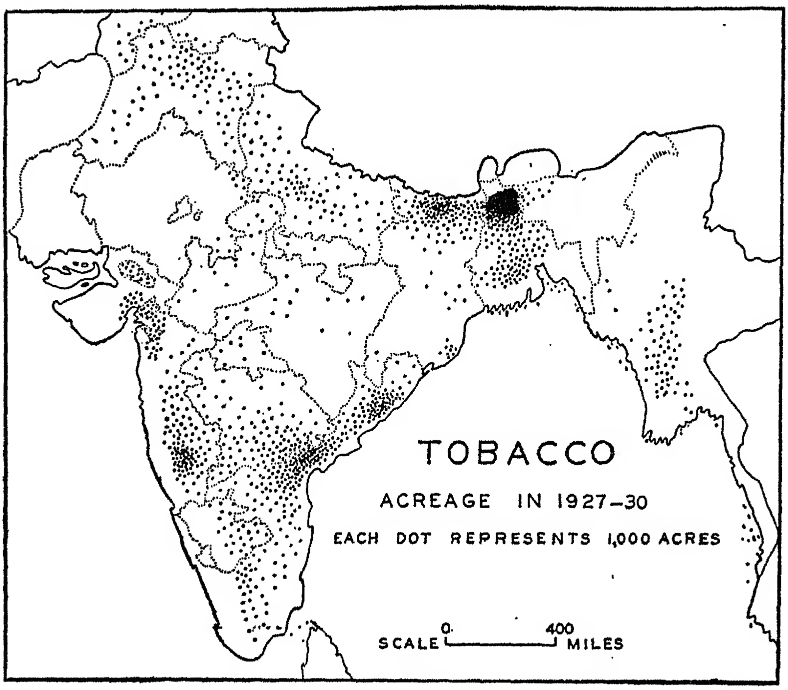

Fig. 65.—The distribution of tobacco in India.

Importance of agriculture.—Agriculture is the chief industry of India. In it approximately 72 per cent of the population is engaged. Indeed, no other country in the world, except China, has a larger population dependent upon the single industry of agriculture. In India, like China, agriculture is intensive in character. Here the peasant (ryot) tills small farms. On the average, five people must derive their living from only 3.3 acres of land.

It is partly the low standard of living of the average Indian that enables him to live on such small pieces of land. Low per

[5] Williamson, A. V.: "Indigenous Irrigation Works in Peninsular India," *Geographical Review*, Vol. XXI (1931), pp. 613-626.

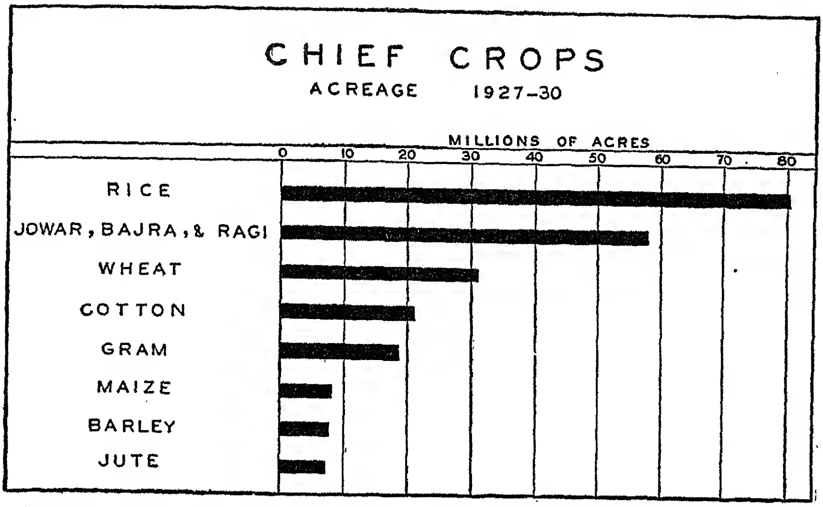

Fig. 66.—The acreage of the chief crops of India and the Indian States. (Based on data obtained from the Department of Intelligence and Statistics, Calcutta, India.)

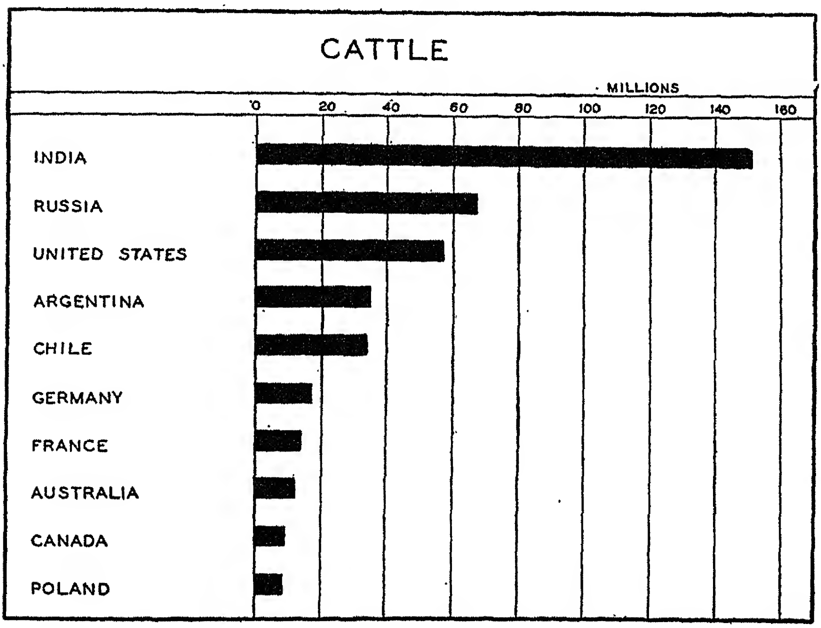

Fig. 67.—India surpasses all countries of the world in number of cattle.

capita productivity is the principal factor contributing to the low living standards of these people.

In spite of the low standards of living, however, India is one of the leading agricultural nations of the world. It contains more than 300,000,000 acres of arable land (Fig. 64). It is second only to the United States as a producer of cotton and tobacco, and ranks second only to Cuba in the production of sugar cane (Fig. 65). It is the chief source of jute, supplying in normal years more than 95 per cent of the jute of commerce. In addition, India is among the leading nations of the world in the production of tea, grain sorghums, flax, and rice (Fig. 66). Even in the livestock industry India is noteworthy, since it surpasses all countries in number of cattle (Fig. 67).

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CHAPTER XII

Agricultural Production in the Major Regions of India

Regional diversity.—A study of India's natural environment reflects striking contrasts from place to place. These are matched by contrasts in economic life. Thus the economic activities of the pastoral nomads of Baluchistan differ markedly from those of the rice farmers of Burma. Between these Indian appendages—Baluchistan and Burma—lies Old India with its varied physical environment, diverse population groups, and distinctive geographical regions. Thus in subdividing the country into regions, environmental as well as human activities have been taken into account. The following pages will deal chiefly with the agricultural adjustments in the various geographical regions of the country.

The Lower Ganges-Brahmaputra jute and rice region.—Bounded by highlands on the north and east, the Lower Ganges-Brahmaputra region consists essentially of lowland, the major part of which is composed of alluvial materials that have been washed down from the adjacent slopes. This lowland is one of the most productive regions of the country. Here the large population, estimated at more than 550 people per square mile, is engaged chiefly in agriculture, especially in the production of paddy rice for food and jute for the world market (Fig. 68).

In this region the rain falls chiefly during the period of the summer monsoon, and therefore at the time of greatest heat and plant growth, as indicated by records taken at Calcutta which disclose the fact that 60 per cent of the total rainfall is received during the three summer months of June, July, and August. Abundant rainfall in this area of low relief

causes considerable inundation of the land during the rainy season, and even in winter many of the lower lands remain waterlogged.

Summer and winter crops.—Owing to the low relief, level topography, and abundant precipitation, the water level rises continuously during the rainy season (summer monsoon) until many of the lowlands along the banks of rivers and streams

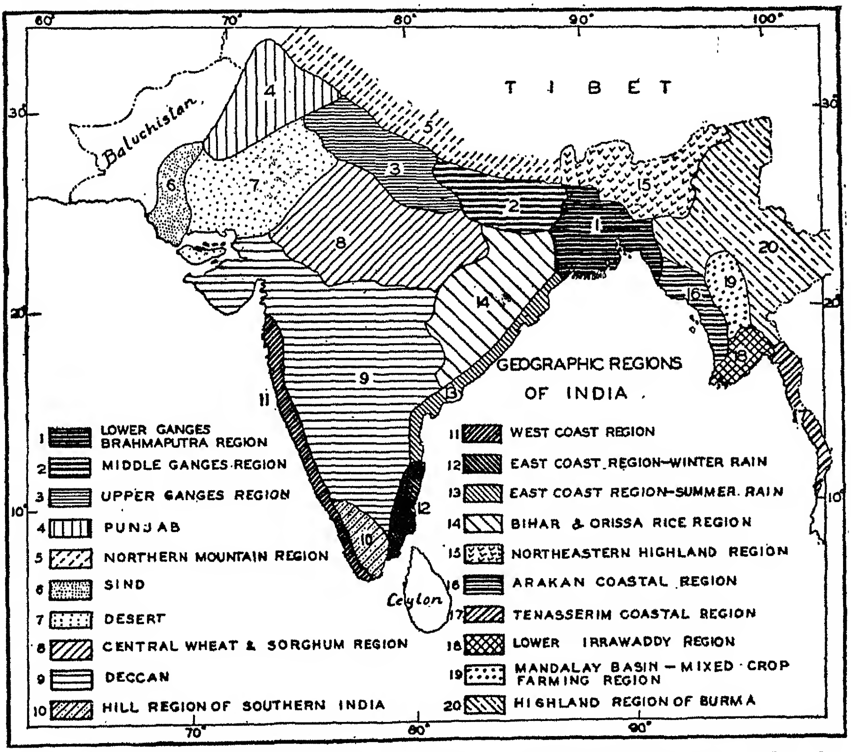

Fig. 68.—The geographical regions of India. (See also map by the author in *Journal of Geography*, Vol. XXVIII (1929), p. 110.)

have become inundated, thereby making suitable areas for the production of paddy rice. The inundation process is so thorough that large areas of land remain soggy, wet, and waterlogged even during the greater part of the winter half-year. It is during the winter season that the crops called "rabi" are grown in India. But in lowlands that have an excessive supply of moisture, crops are limited in variety and number. Indeed,

rice constitutes the most important crop during winter as well as summer in the Lower Ganges-Brahmaputra region.

Rice the crop of greatest importance.—Rice is grown in many parts of India, and covers more land (approximately 81,000,000 acres) than any other crop (Fig. 69). But it

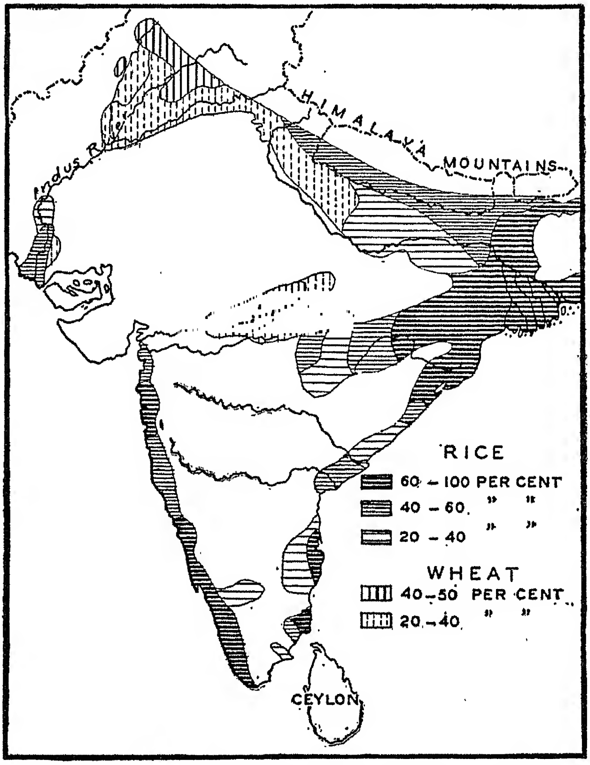

Fig. 69.—Percentage of total cultivated area given to rice and wheat in the most important regions producing those cereals. (After J. Sion and *Geographie Universelle.*)

reaches its maximum development in a hot, moist climate, especially in areas where level lowlands favor the inundation of the cultivated soil. These conditions are found in favorable combination in the Lower Ganges-Brahmaputra region, where 80 to 90 per cent of the cropped land is given to rice. In this region, contrary to the more sparsely populated lands of Burma, Siam, and French Indo-China, the dense population consumes the greater part of the rice crop.

Jute.—India enjoys a world monopoly in the production of jute, a commodity that is used for the making of gunny sacks, burlaps, and jute bags—products in constant demand. Commercially this crop holds a unique place among the various commodities exported from India. During the period 1928-1932, $234,000,000 worth of jute manufactures and raw jute were sent annually to foreign countries.

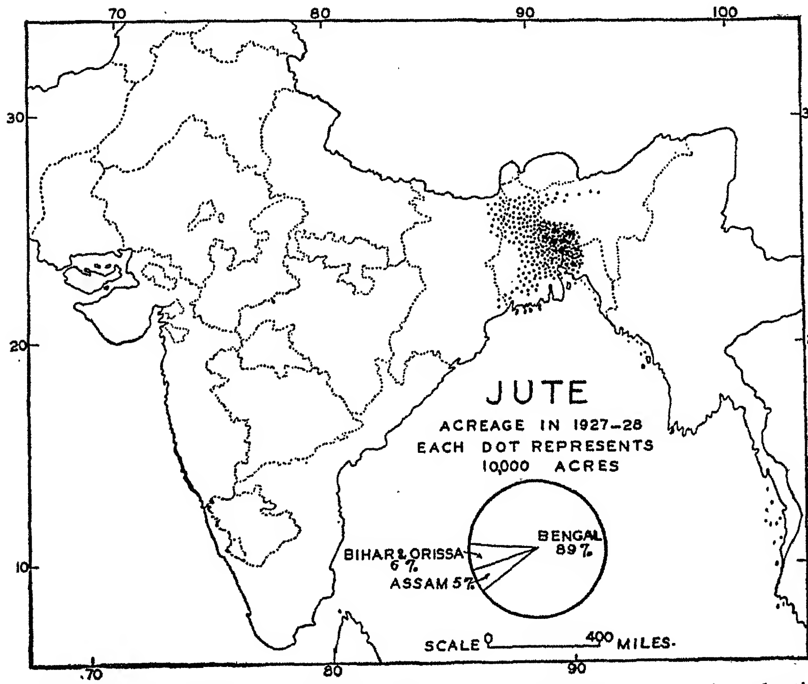

Fig. 70.—The distribution of jute in India. Note the concentration of production in the Lower Ganges-Brahmaputra region.

The annual production of jute in India during the last decade (1920-1930) has been approximately 8,300,000 bales (400 lbs. each), ranging from 5,900,000 bales in 1920 to 9,000,000 bales in 1930. In the latter year India produced more than 99 per cent of the total jute crop of the world. The other areas producing jute in commercial quantities are Nepal, Formosa, Japan proper, and Indo-China.

Localization of jute production.—One of the striking features of the jute industry of India is its marked localization in the eastern part of the Lower Ganges-Brahmaputra Valley (Fig. 70). This concentration of production in a small area attests the favorable combination of environmental factors found here. Of major importance are the low latitude climate, fertile soils, low relief, suitable water for retting purposes, and abundance of cheap labor. Like the greater part of India, this region receives most of its precipitation during the time of the summer monsoon, but it also is favored with early rains (during May). The jute plant therefore, by getting the early rains, grows four to five feet before the beginning of June and July, the time when the summer monsoon has reached its maximum development.

Agricultural practices and jute production.—At present rather primitive methods of cultivation are used in growing this plant. Fortunately, the soil of the Bengal region is not as heavy or compact as that of many other areas, and it therefore does not require such intensive working—an advantage in a region where most agricultural implements are crude and primitive in character. After plowing, the natives break the clods with hand mallets or mash them with a primitive roller called the "hengha." The next process—similar to harrowing in the United States and western Europe—is performed with an implement called the "ladder," which is made of bamboo with pins projecting through the bottom to scratch the soil and collect roots of previous crops. This operation is carried on numerous times during the winter and spring months.

Sowing continues from February to June, the exact date depending upon the variety that is grown. Since jute seed is small it may be drilled or sown broadcast. After sowing, the ground is harrowed lightly, after which it is slightly compacted by drawing a light log of wood or a bamboo ladder over it. In a normal season the plant will reach maturity in about four months. Then comes the period of harvest, after which the fiber is separated from the stalk by being immersed in water from 8 to 30 days, the exact length of the period being

influenced by the environmental conditions of the district in which the operation is performed. The low mineral content of the water in the region east of the Lower Brahmaputra facilitates retting. When the last layers may be easily separated from the core of the plant, the work of steeping ceases and the process of stripping begins.

Jute manufactures.—Jute fiber was practically unknown to Europe and America a hundred years ago, but it has been used in India for centuries in the making of cord, twine, and various coarse fabrics. There, also, the gunny sack was first produced by hand looms. In 1822 some fiber was sent to Dundee, Scotland, now the western home of the jute industry. At that time Dundee was a comparatively important textile manufacturing center of flax and hemp; and the same machinery could be used in the manufacture of this longer and coarser fiber. Dundee exports large quantities of gunny sacks to various portions of the world: to the coffee districts of Brazil; to the wheat fields of the United States and Argentina; to the wool-producing areas of Australia; to the sugar fields of Cuba; and to the quebracho area of the Gran Chaco of Argentina.

Within recent years Calcutta has become one of the most important centers of jute manufacture. Formerly an exporter mainly of raw jute, Calcutta is today exporting manufactured jute in increasing quantities. Attention was directed by the British to the possibilities of manufacturing jute goods by machinery in India, and in 1858 a small consignment of machinery was dispatched to Calcutta. Development of the industry, however, was slow, owing to the fact that it was difficult to induce the natives to remain inside the factories during the period of training, and it was equally difficult to keep the trained operatives constantly employed. Yet this industry increased so that at present exports of jute manufactures exceed those of the raw material.

The Middle Ganges region.—Like the Lower Ganges-Brahmaputra region, the land embracing the middle part of the Ganges Valley has alluvial soils, abundant rainfall, and a

dense population engaged chiefly in agricultural production. Yet there are differences between these two regions of India. Thus, the altitude of the Middle Ganges region is higher, and its relief is greater than that of its neighbor farther down stream. The drainage is therefore better, and the soils are less waterlogged. Drier soils make possible a greater variety of crops.

Drier soils are realized not only because of the greater relief and better drainage, but because the rainfall of this region is also less than that of the Lower Ganges. Thus Patna receives 38 inches of rain from June to September, whereas Calcutta gets an average of 46 inches during the same period. This is due to the fact that the Ganges plains derive their rainfall mainly from the Bengal branch of the monsoon, the winds sweeping up the Ganges Valley. The total amount therefore decreases with distance from the Bay of Bengal.

Irrigation.—Relief, rainfall, and the types of crops grown combine to determine the irrigation system. Although this region is higher above sea level than the Lower Ganges-Brahmaputra region, the ground-water level is so near the surface over most of the area that the well system of irrigation is facilitated. In addition, the rainfall is so abundant that irrigation waters are needed only as a supplement to the normal amount. Lowland rice, the most widely cultivated crop, can stand an abundance of water; but crops grown during the winter half-year, or the dry season, require an artificial water supply. Thus the high water table, the rainfall regime, and the crops that are grown combine to make irrigation by means of wells the logical practice.

Agriculture.—As in the Lower Ganges-Brahmaputra region, rice is the most widely cultivated crop and the most important kind of food. In addition, this region produces large quantities of flax seed, sugar cane, Indian corn, and barley. Moreover, wheat production begins in the lower portion of this region and increases in importance with distance up the Ganges Valley. Here rice and corn are summer (kharif) crops; whereas barley, wheat, and flax are grown during the

winter season (rabi crops). Sugar, on the other hand, frequently grows for more than twelve months—a condition made possible by the low latitude climate of this region.

Flax.—In India flax is grown almost exclusively for seed, and in the production of flax for seed, India ranks fourth among the nations of the world.[1] As a producer of flax seed two Indian regions are of major importance—the Middle Ganges and the region of the Central Provinces. In the Middle Ganges region flax production is favored by a number of factors, chief among which are alluvial soils, abundance of cheap labor, and the large demand for oil.

Flax is one of a group of oil seeds, including rape, mustard, and sesame, grown for cooking and lighting oils. In India much of the crop is grown in admixture with these other crops. The local demand for this commodity is very high.

The low latitude location of this region enables the Indian peasant (ryot) to grow flax the year round. The common practice, however, is to sow the crop in October or November. It grows during the dry season and is harvested in March or April, before the beginning of the monsoon rains.

Sugar.—In normal years India ranks second only to Cuba in the production of cane sugar.[2] Although the crop is grown throughout most of peninsular India, the Middle and Upper Ganges regions are the chief producers. The fertile alluvial soils, the high temperatures throughout the year, the abundance of rainfall during the summer monsoon, irrigation in winter, and the dense agricultural population are factors to which production has adjusted itself in this part of India. Here sugar cane, planted during the dry season, usually February to April, is irrigated by means of wells and canals, and is harvested from ten to fifteen months after the time of planting. Owing to the dense population, most of the crop is consumed at home in the form of gur, a low grade of soft brown

[1] In the production of flax seed India is normally surpassed only by Argentina, Russia, and the United States.

[2] In 1928 and 1929 Java surpassed India in cane sugar production. Yet during the greater part of the last few decades India has been second only to Cuba in the production of this commodity.

sugar. In addition, India must import sugar in large quantities. The average annual importation of sugar amounted to $49,000,000 during the period 1928-1933.

Corn.—India ranks among the ten leading corn-producing nations of the world. Yet the local importance of the crop is small, since it occupies less than three per cent of the cropped

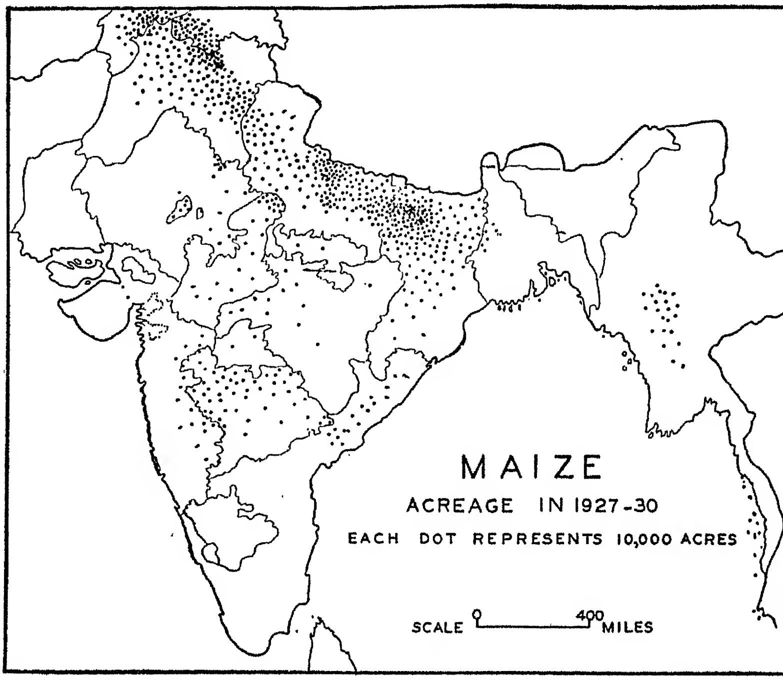

Fig. 71.—The geographical distribution of India's maize acreage. Note the concentration of production in the Middle and Upper Ganges regions and in the Punjab.

land of the country. The greater part of the crop is consumed at home, very little entering the export trade.

The Middle Ganges region is one of two major producers of corn, the other being the Punjab (Fig. 71). Throughout this entire area corn is grown as a summer (kharif) crop, especially on well drained land, since soggy or waterlogged soils cause root rot.

Barley.—As a producer of barley, India is one of the most important countries in the world, the average annual produc-

tion for a recent ten-year period (1920-1930) being 128,000,000 bushels. In the production of this commodity the Middle Ganges region is the most important area in India (Fig. 72). Here barley, like wheat, is grown during the winter half-year. It is consumed chiefly at home as a food for man and a feed for animals.

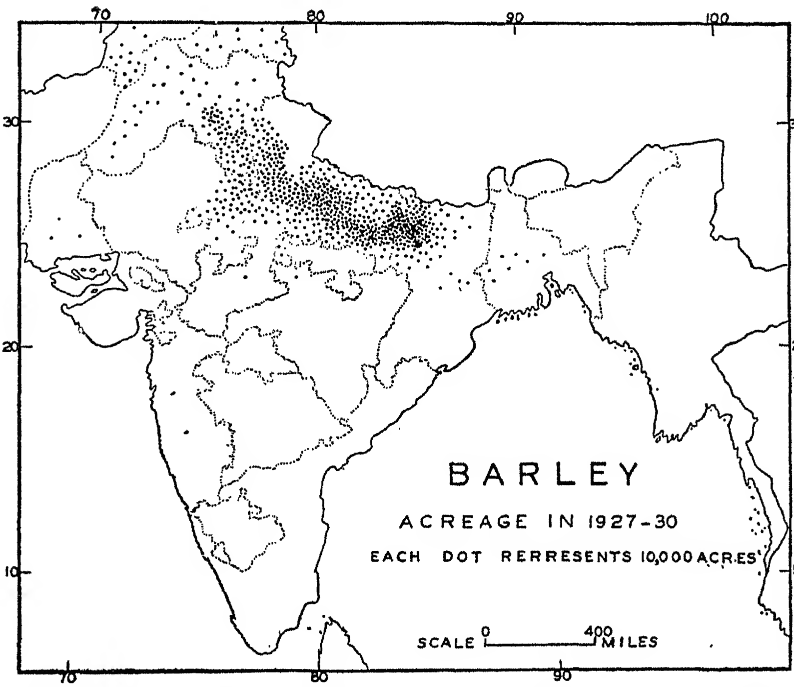

Fig. 72.—The geographical distribution of India's barley acreage. The Middle Ganges region constitutes the chief area of production.

Benares the chief city of the Middle Ganges region.—The Gangetic Plain contains but few large cities. The lower part of the plain has its Calcutta; the Middle Ganges has Benares, the holy city of the Hindus. It is one of the most ancient cities in the world. Sakya Muni, the Buddha, came here from Gaya in the sixth century B. C., and in the seventh century Benares contained 30 Buddha monasteries. But Hinduism has now supplanted Buddhism, and the Brahman fills the place of the monk.

As seen from the river, Benares presents a scene of great picturesqueness and grandeur. The Ganges here forms a great sweep of about four miles in length. Situated on the northern, outer bank of the river, Benares not only serves as a trade and manufacturing center but also as a center of major social prominence. The bank of the river is entirely lined with stones, and there are many fine ghats or landing-places built by pious devotees. These are generally crowded with bathers and worshippers, who come from all sections of India to wash away their sins in the sacred waters of the Ganges.

The manufactures of the city fall far short of supplying the needs of the local territory. Large industrial establishments are practically lacking, and industry is confined chiefly to the cottage and workshop. The making of gold and silver thread, gold filigree work, German-silver work, embossed vessels, and lacquered toys are among the important types of industry. The brass work for which Benares was famous in former years has greatly degenerated.

The wheat region of the Upper Ganges.—As has been stated, precipitation decreases with distance up the Ganges Valley. In addition, the rainfall becomes more unreliable both as to amount and time of occurrence. The Upper Ganges region therefore requires a more constant supply of water for irrigation. To obtain such a supply, canals have been dug and extended to many parts of the region. Well irrigation merely supplemented the rainfall in the region of the Middle Ganges, whereas the drier area of the Upper Ganges must depend almost entirely upon an artificial water supply, which is best secured by means of canals.

The chief crops.—Like the Middle Ganges region, this area produces a number of crops, the most important being wheat, sorghums, barley, rice, sugar cane, gram, and maize. Wheat and the grain sorghums (jowar and bajra) increase and rice decreases in relative importance with distance up the Ganges Valley. Wheat production is extensvie agriculture and, com-

pared with lowland rice, yields less per acre. The population here is sparser than it is farther down the Ganges Valley.

The Punjab.—The Punjab takes its name from the five rivers (Indus, Chenab, Jhelum, Ravi, and Sutlej) which water this area (Fig. 73). This division of India comprises a large area of land, embracing the British Province of Punjab and

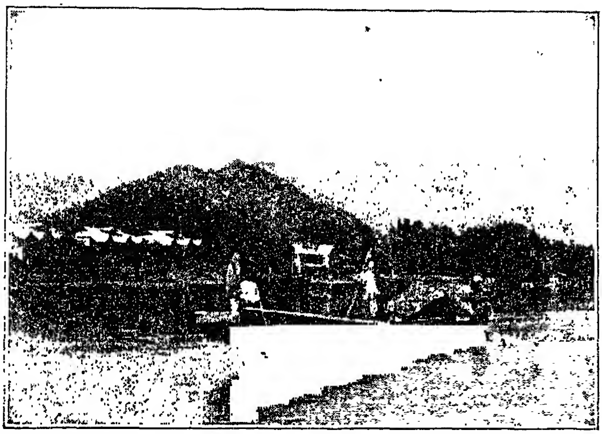

Fig. 73.—In the Punjab on the Jhelum River. (Courtesy India State Railways.)

34 native states. The British Crown-owned area contains 97,209 square miles and the remaining 36,532 square miles are under the rule of native princes. The combined area of Punjab is therefore larger than the British Isles. The native states vary greatly in size, ranging from Bahawalpur, with an area of 15,000 square miles, to little Darkoti, with 8 square miles.

Use of the land.—Of the total area in the Punjab, approximately 42,000 square miles constitute cropped land. An additional 29,000 square miles consist of arable waste or fallow, the remaining land being chiefly non-arable waste—mainly stone land, rugged land, and river beds. Of the cultivated land the greater part is given to wheat, pulse, millets, sorghums, and cotton.[3]

[3] *Foreign Crops and Markets* (June 18, 1928), Washington, D. C., p. 925.

Largest irrigated area in India.—The Punjab contains more irrigated land than any other political division of India. In this region approximately 14,000,000 acres consist of irrigated land, the larger part (9,000,000) being irrigated by means of canals.[4] The canal system, which had its beginning with the early Mohammedan rulers, is one of the finest in the world. These ancient canals have been modernized and further extended in recent years, and still other canals have been dug recently. One of the largest of these is the Sutlej Valley irrigation project, which furnishes water for 5,000,000 acres of land.

Until recent years, work on irrigation projects was performed almost entirely by hand. But it has been found that the use of machinery is more economical in spite of low labor costs. In addition, the work can be pushed to completion even when the thermometer reaches 120° F, as it sometimes does during the "hot season" (April to June).

Irrigation works in the Punjab have resulted in the opening to cultivation of large areas of relatively unleached, fertile soils which had hitherto been unsuitable for agricultural development because of the lack of water. Such irrigation projects have resulted in the development of what are known as canal colonies. The results may be gauged from the fact that Lyallpur, the capital of the upper Chenab colony, now has a large export trade, and the population of the area of which it is the center increased from 8,000 to 979,000 in the course of 15 years (1915-1930).[5]

Agriculture chief source of wealth.—Agriculture is the chief source of income for the 25,000,000 people living in the Punjab. Crop yields, due to the excellent canal system made possible by the "five rivers" which spread through the area, are generally bountiful, notwithstanding the deficiency of rainfall. As in other parts of India, the year-round growing season makes it possible to produce crops in winter as well as in

[4] Of the total amount of irrigated land, only 34,000 acres are found in the Punjab States, the remainder being located in the British Province of Punjab.

[5] *Trade Information Bulletin* (April, 1926), Washington, D. C., p. 17.

summer. Summer (kharif) crops consist of millet, maize, rice, pulses (beans, peas), cotton, and sugar cane; whereas wheat, barley, oil seeds, and gram constitute the chief crops grown during the winter half year.

The most important wheat region of India.—Wheat is one of the most widely grown crops of India, being surpassed in

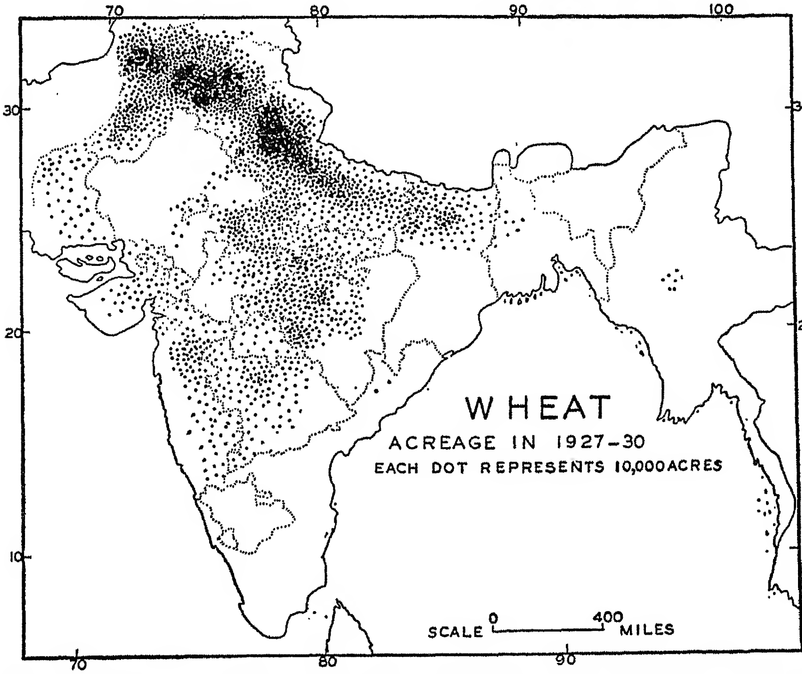

Fig. 74.—The geographical distribution of India's wheat acreage. Note the importance of the Upper Ganges region and the Punjab.

acreage only by rice and the Indian millets (Fig. 66). Moreover, India is one of the leading wheat producing countries of the world, being surpassed only by the United States, Russia, Canada, and China. The production of this commodity is concentrated mainly in the northwestern part of India, approximately one-third of the total Indian acreage (10,000,000 acres) being found in the Punjab (Fig. 74).

In this region a considerable part of the wheat area is irrigated and is, therefore, less subject to the fluctuations caused

by lack of rain. Where irrigation is not used, a drought almost inevitably occurs to cause a failure of the wheat crop in some part of the country. On irrigated land the wheat yields approximately 16 bushels per acre, whereas non-irrigated land yields 30 to 50 per cent less. The yield is therefore low as compared with that of many other wheat-producing countries.

Although India is one of the major wheat exporting countries in the world, this market is not to be depended upon. In

Fig. 75.—Shepherds in the northern highlands of India. (Courtesy India State Railways.)

some years the country may have no exportable surplus, whereas in other years it may exceed 80,000,000 bushels. Such fluctuations attest the variations in precipitation. When a shortage occurs it is generally necessary for the government to prohibit the export of wheat and sometimes even to regulate prices within the country.

In the world market, Indian wheat has the advantage of being harvested in the early spring, and it is therefore available at a time when supplies are running low in North America and Argentina. Ninety per cent of the wheat exported reaches the world market through Karachi, the only major port serving the Punjab wheat district.[6]

[6] *Trade Information Bulletin,* No. 397, Washington, D. C., p. 11.

Other crops.—The other major crops of the Punjab include the sorghums, millets, gram, and cotton. The sorghums and millets constitute subsistence crops, whereas cotton is one of the important cash crops of this region. Some of the cotton, however, is retained at home as raw material for local industries.

Agriculture versus manufacturing in the Punjab.—Agriculture constitutes the mainstay of the Punjab, yet an important manufacturing industry has also been developed. Here modern or semi-modern factories and cottage industries flourish side by side. In some centers, especially Amristar and Gurdaspur, prosperous woolen factories and cotton weaving plants give employment to many thousands of villages. The raw cotton is obtained locally, and the wool is obtained from both the local area and the adjacent pastoral highland areas.

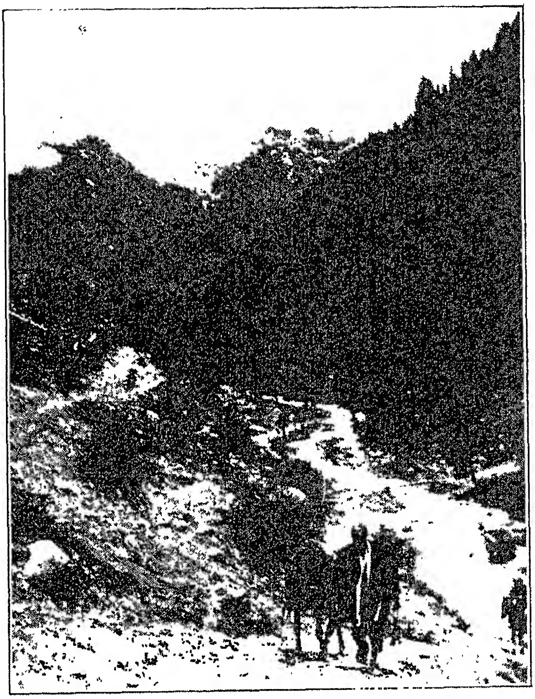

Fig. 76.—Crossing a mountain torrent in India's northern highlands. (Courtesy India State Railways.)

The northern mountain region.—The northern mountain region embraces the high Himalayas and their foothills. In this region the southern slopes of the mountains present altitude zones of considerable cultural and economic significance. These slopes show stratified zones of tropical, semi-tropical, temperate and arctic climate, to which plant, animal, and human life conform. In fact, a journey up these mountain slopes to a height of 20,000 feet or more corresponds climatically to a trip from the tropics to arctic areas.[7]

Human adjustments to environment.—Human activities in the northern mountain region are varied, and attest the diversity in environment from place to place. But agricultural activities predominate. Upland rice and tea are produced on small patches of cleared land. Parts of these mountains constitute some of the best hunting grounds in the world. In other parts valuable trees, especially teak and sal, are exploited and sent to the adjacent and essentially treeless Gangetic Plain. But above all, from the standpoint of European control of India, this mountainous region serves as a place of refuge from the intense heat and enervating conditions of the Gangetic Plain to the south. Hill stations have been established to which people and government move during the most oppressive times of the year.[8]

In many parts of this northern mountain region of India pastoral activities are well developed. Livestock products such as skins, hides, wool, and hair have long been important exports (Figs. 75 and 76).

The Sind: A region of inundation irrigation.—Bounded on the west and north by mountain ranges, on the south by the Arabian Sea, and on the east by the Thar Desert, Sind owes its present-day significance mainly to the life-giving waters of the Indus—waters that come chiefly from the Punjab to the north. Upon this river depends the agricultural life of the

[7] Since there is a decrease of 3°F. for every 1,000 feet increase in altitude, it is a relatively simple task to calculate the difference in temperature between various zones located in the Himalayas and that of the Indo-Gangetic Plain to the south.

[8] Holdich, T. H.: *India*, D. Appleton and Company, New York, 1905, p. 125.

Province of Sind. By overflowing its banks year after year, and spreading silt over the surrounding country, the Indus has brought into existence the fertile alluvial lands comprising a large part of this division of India.

Climatically, Sind is a desert with an average rainfall of

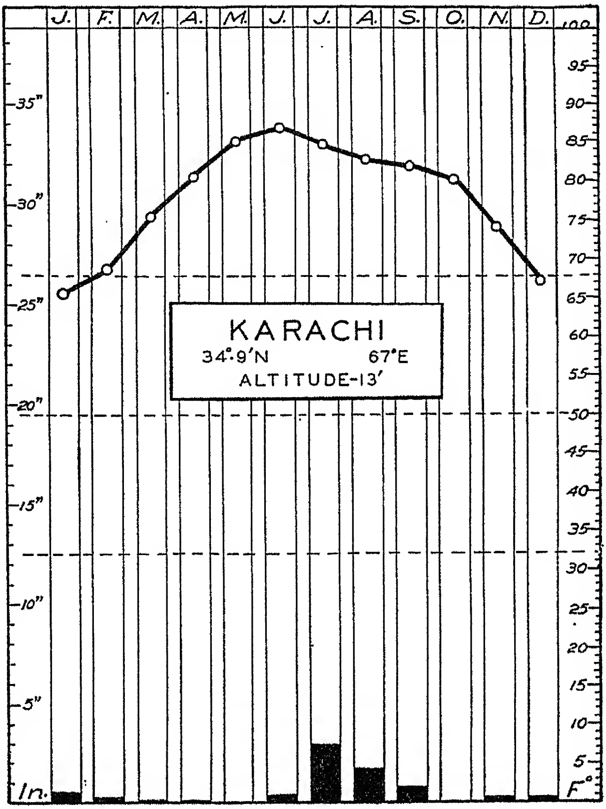

Fig. 77.—Karachi, a desert station in Sind, India.

only 5.5 inches annually, the greater part coming during the time of summer monsoon (Fig. 77). The vegetation is extremely sparse, and consists mainly of xerophytic types (drought-tolerant), which enable only widespread pastoral pursuits where irrigation waters are lacking. The small rainfall has caused but little washing and leaching of the essential

mineral plant foods and lime, and crops yield abundantly in the irrigated districts.

Inundation irrigation.—The Indus River has regular seasonal fluctuations in its surface level. At Sukkur, located 350 miles from the sea, there is a maximum rise in flood season of about 20 feet over the lowest water during the period of winter monsoon. At Kotri, situated 120 miles from the sea, there is a rise of 17 feet. The course of the Indus is along the top of a ridge, the land on either side sloping away from the river to lower levels. In the irrigated part of Sind Province the average slope of the land is in the direction parallel to the river. For centuries Sind farmers have taken advantage of the slope of the river and the slope of the land away from the river by excavating canals to carry water to their lands.

A moderately high river, sufficient to give flow irrigation to some lands and lift it to a much larger area, may be expected in some years to last three or four months, beginning with June—so as to permit the growth of the hot-weather crops. The canals designed to work under these conditions are known as "inundation canals," of which type the British have made several new ones.

The inundation canals, however, are closed and useless, except when the river is high, for approximately four months each year. For the remainder of the year no cultivation is possible in areas served by these canals, except by deep wells and crops grown without watering, the land having been flooded deeply before cultivation.[9]

Agriculture the chief source of wealth.—In the Province of Sind agriculture is the chief source of wealth. Half the total area of 30,000,000 acres consists of cultivable soil and more than 50 per cent of the total population of 3,500,000 depends directly upon the land for existence. Rice, millets, cotton, and wheat are the principal crops. Only irrigation enables the production of rice in this desert area, and the other crops are also directly dependent upon the irrigating waters. This de-

[9] Adopted from Sabine, E. G.: "Lloyd (Sukkar) Barrage and Canals Project," *Commerce Reports* (Sept. 29, 1924), Washington, D. C., pp. 785-86.

pendence, however, varies with the precipitation. Thus, in years of copious rainfall more than 70 per cent of all crops is raised by irrigation, and in years of low rainfall approximately 99 per cent.

The desert: a region of pastoral nomadism.—This region, commonly called the Thar, gets less than 10 inches of rain a year. The low rainfall is due to a combination of factors. During the summer months northwest India constitutes a low pressure center, which, by reason of its location, gets but little rain. Winds blow into such a center from all directions. Those which blow from the northwest move from higher (colder) to lower (warmer) levels as well as from dry lands, and therefore will absorb rather than precipitate moisture. On the east, north, and northeast the inflow consists of air which has lost its moisture during its passage up the Ganges Valley. When this air descends into the Punjab it is dried still more. Even the inflow from the Arabian Sea to the west does not bring the rainfall which a casual glance at the map of this part of India might suggest. The air over the northern part of the Arabian Sea is by no means saturated with moisture, since it has mingled with the dry air of the lands to the north and west.[10]

Pastoral nomadism.—In this region of India, pastoral nomadism constitutes the most widespread economic adjustment. Here the nomadic groups are far-reaching, traveling from place to place in search of pasture for their livestock. During periods of extreme aridity even the hardy desert plants wither, and the nomad as well as his stock face starvation. Under such conditions the only thing that occurs to him is to plunder. Thus he makes raids upon neighboring tribes and oases. The people of this part of India have indeed always been militaristic in character.

The rugged wheat and sorghum lands of north central India.—This region is bounded on the north by the Upper Ganges region and on the west by the Thar Desert. Unlike

[10] Kendrew, W. G.: *The Climates of the Continents*, The Clarendon Press, Oxford, 1922, pp. 114-15.

the desert, it has a moderately abundant precipitation, and some crops are grown even without the aid of irrigation. Here wheat, jowar, bajra, and rice are the chief crops as is the case also in the Upper Ganges region. But unlike the latter area, the crops are grown on relatively rugged topography. Agricultural practices therefore differ from those in

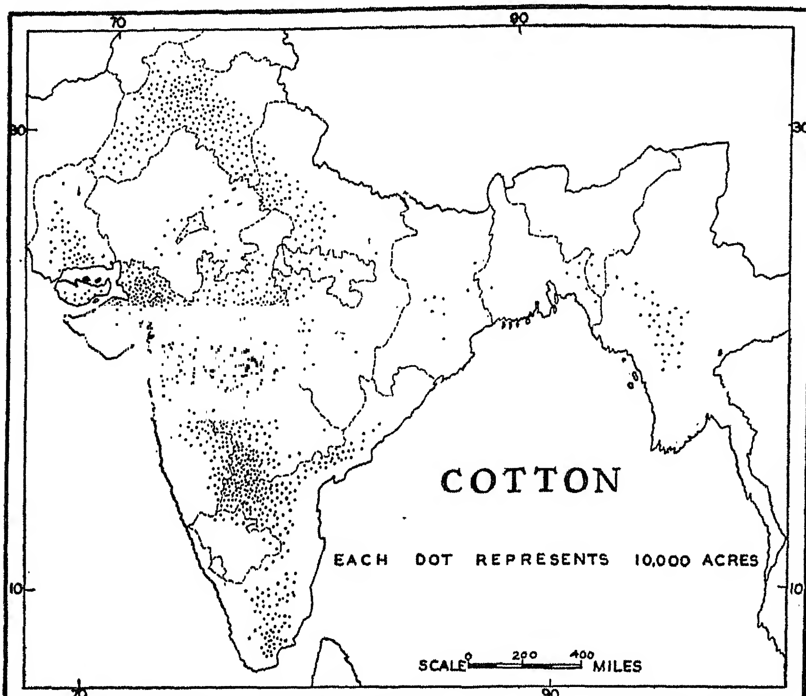

Fig. 78.—The geographical distribution of India's cotton acreage. Average annual acreage for the period 1928-1930.

the Indo-Gangetic Plain. Canal irrigation, which attains maximum development on the plains areas to the north, is displaced in major part by tank irrigation (Pages 182-183).

The Deccan: India's chief cotton producing region.—India is surpassed only by the United States in the production of cotton, a position that it has held for many years. The greater part of this Indian cotton is grown on the rolling upland of the Deccan, a land of light and irregular rainfall (Fig. 78). The importance of this area as a cotton producer has

been a major factor in making Bombay, a center located west of this region, the principal cotton-manufacturing city of India.

Cotton production related to climate.—The rainfall of the Deccan of India is uncertain. Years of plenty are followed by years of dearth, and drought frequently injures the crop. The solution to this problem in many areas would be to build a more extensive system of irrigation, especially by means of canals. Large parts of the Deccan are so rugged that canal irrigation would be an unprofitable enterprise. In some such areas, however, tank irrigation has been developed (Fig. 63).

The rainfall of the Deccan is not only irregular, but it is also concentrated mainly in the summer season. The period of cotton production is therefore narrowly limited, especially where irrigation is but little practiced or where irrigation is utilized in the production of other crops. Under such conditions the Indian cotton production has been confined largely to the poorer grades or short-staple varieties, which are better suited than long-staple cotton to the short period of rainfall.

Cotton production and soils.—The most important part of the cotton-producing region of India is sometimes called the Black Earth Belt. The name is derived from the soil color, which has resulted from the decomposition of the basaltic rocks which cover about 200,000 square miles of peninsular India. This black soil is very fertile, especially considering its tropical location, and remains productive although cropped for hundreds of years. A peculiar character which renders it of much value in the dry climate of this area is its remarkable tenacity of moisture. Instead of allowing the rain to drain away, it becomes a tenacious mud during the wet season.

Transportation as related to cotton production.—Although many roads and railroads extend from Bombay into this cotton producing area, there is considerable room for improvement. Much has been done by the British Government to develop the transportation in the interior of India. In fact, India has about four times as many miles of railroad as has China, but much of the land still lacks suitable communi-

cation with world and sectional trade. Numerous roads have been built to the railway lines, but these are often in poor condition, frequently being impassable after rains.

The future of cotton production.—The future development of India's cotton industry depends mainly upon the production of more lint per acre and not upon the expansion of the cotton acreage. Although India is the second largest cotton producing country in the world, its per acre production is extremely low, being only 83 pounds per acre in 1930. Since raw cotton is normally the leading item of India's export trade, an increase in the production of this commodity, especially when the increase is associated with production at lower cost, would enable the Indian people to obtain from abroad additional economic goods that are lacking within the country. Yet India is one of the most feared competitors in the production of cotton, mainly because of the cheap labor.

Grain sorghums and millets.—Although cotton is widely grown in the Deccan of India, the grain sorghums and millets occupy a larger acreage and constitute the grains upon which the people of this region depend for food as well as feed. Unlike the western and eastern coasts and the Ganges Valley, this interior part of peninsular India grows but little rice, the grain sorghums and millets taking the place of rice in the agricultural economy of the region.

In the northern part of the Deccan, jowar and bajra constitute the chief grains. These grains yield most abundantly on the more fertile soils of this area. But farther south, especially in the southern part of the Deccan, rainfall is more erratic, the soils more sterile, and the percentage of uncultivated land increases. In this part of the Deccan, ragi, or Indian millet, is the chief grain, since it grows better than jowar or bajra on soils that are slightly sterile. It also keeps well, but it is not considered as palatable as the other grains.

Irregular crop production and famines.—In this part of India the rainfall is unreliable, years of abundant precipitation being followed by years of dearth. In some areas, especially where a dense population depends upon the harvest of

the summer season, even a slight deficiency of rainfall may cause very severe famines.

Man is unable to control rainfall, but he can provide measures which reduce the liability of a region to famine. Chief among these measures are: promotion of railways; extension

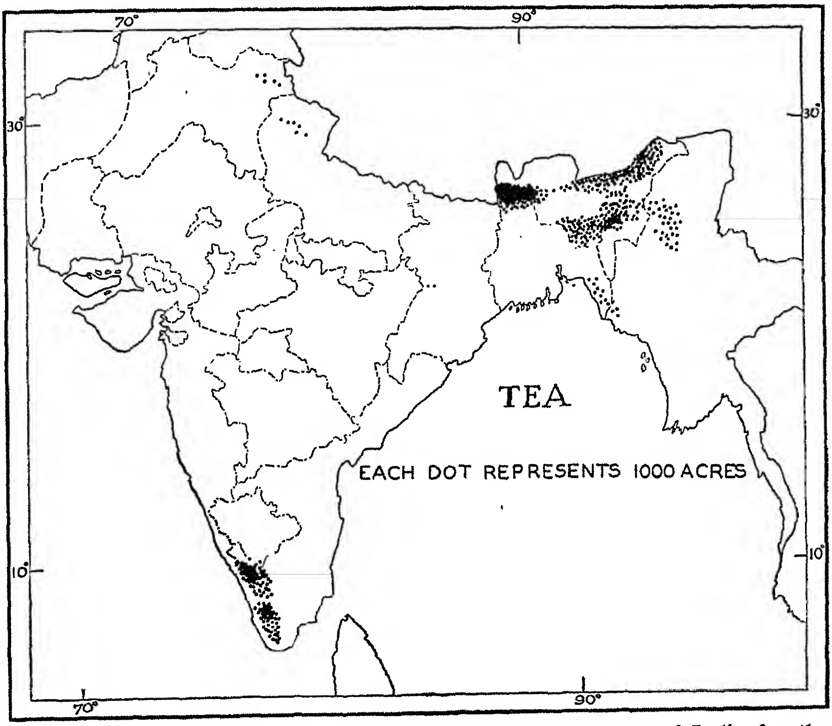

Fig. 79.—The geographical distribution of the tea acreage of India for the period 1927-1930. Note the concentration of production in the hill region of southern India and the northeastern highland region.

of irrigation; reclamation of waste land; introduction of agricultural improvements, such as proper crops and crop rotations; emigration; and, where necessary, revision of the local revenue or rent systems.

The hill region of southern India.—In the extreme southern part of India, between the Eastern and Western Ghats, the rolling land of the Deccan Plateau gives way to a series of large hills which have become commercially important

through their production of tea and coffee. Here the Nilgiris, Anaimali, and Cardamon Hills together constitute the second most important tea-producing region of India (Fig. 79) and the only major coffee-producing district.

A glance at the map would seem to indicate that the chief tea districts of southern India extend over the western escarpment of the Ghats. A detailed survey, however, discloses the fact that these districts are located mainly east of the Ghats upon the hills of the less steeply inclined slopes of the dissected tableland.

The environment of the hill region of southern India favors the production of grain sorghums and millets for domestic food and feed and tea for export. This area receives heavy rainfall from the western or Arabian Sea branch of the Indian monsoon, which, after flowing for thousands of miles over warm tropical seas, impinges upon the precipitous Ghats, where the rainfall reaches 100 to 150 inches a year. Farther east the precipitation decreases. The entire southern part of India is favored by nearness to the equator (9° to 12° N. latitude), and therefore receives a moderately uniform rainfall throughout the year, the dry season being reduced to only three months. Moreover, in these low latitudes the temperatures are high throughout the year, which in combination with abundant precipitation, favor the production of tea. Since the tea plant knows no dormant period but continues to flush throughout the entire year, picking goes on continuously at intervals of 7 to 14 days. The number of pickings, however, is affected by the elevation of the plantations. In general this part of India has a marked advantage over northeastern India, since the latter area has a cool season (3 to 4 months) during which leaf growth practically ceases. In both regions, slope wash and gullying are serious problems on many of the estates. Terracing is practiced in some districts. Other methods include the planting of voer crops and trenching the steeper hillsides at right angles to the slopes.[11]

[11] Trewartha, Glenn T.: "The Tea Crop," *The Journal of Geography,* Vol. XXVIII (1929), p. 7.

From the standpoint of quality the tea of southern India differs from that of the northeastern districts (Assam and Bengal highlands). On the whole, the tea from this part of India is not of such fine quality as that from the northeastern tea districts of the country. Most of it should be considered of medium grade. But in the higher slope lands of the Nilgiri Hills some of the tea is comparable in quality to the better teas of Ceylon.[12]

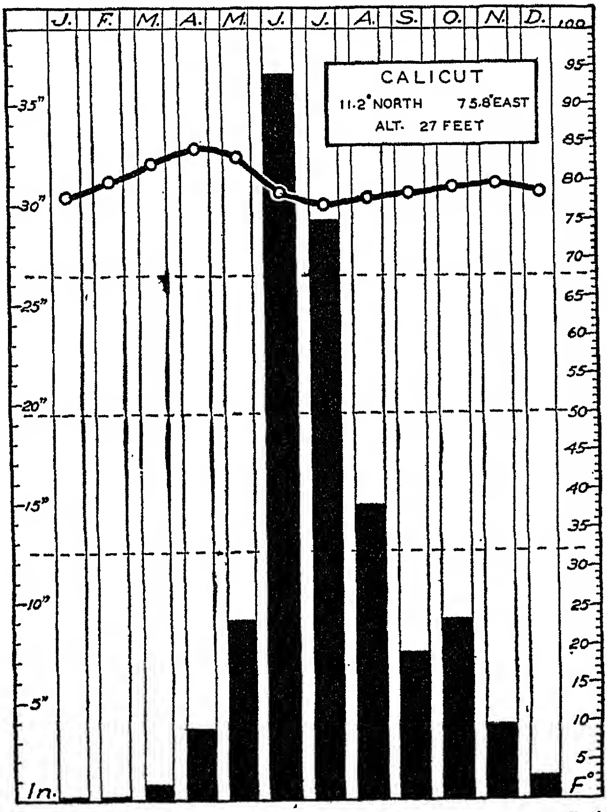

Fig. 80.—Average monthly temperature and rainfall records at Calicut, located in the west coast region of India.

The rugged west coast region.—In this part of India the Western Ghats descend abruptly to the narrow Malabar coastal plain. This entire area—western slopes of the Ghats

[12] *Ibid.*

and the Malabar coastal plain—receives the direct influence of the southwest monsoon, and is therefore well-watered during the summer season. In fact, the southern part of this area receives from 100 to 150 inches of rain per annum (Figs. 80 and 81).

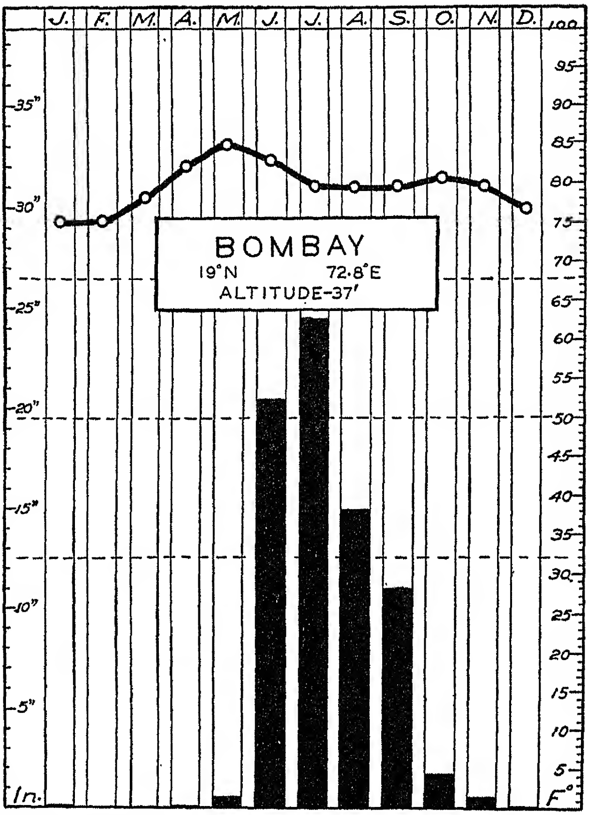

Fig. 81.—Average monthly temperature and rainfall records at Bombay. Note the concentration of precipitation during summer.

In this area of rugged highland slopes and narrow coastal plain but little of the land is under cultivation, the non-cultivated area being devoted mainly to forests. The abundance of moisture favors the production of rice as the chief cultivated crop. In fact, from 60 to 100 per cent of the cropped area is given to this cereal.

The secondary and cash crops grown in the rugged west

coast region are distinctive. Just as the Lower Ganges-Brahmaputra region has jute for its secondary or cash crop and the Deccan has its cotton, so this region has its spices, rubber, and some tea. It was to this western coast of India that the Portuguese sailed even as early as the first part of the sixteenth century to obtain the spices that were eagerly sought by the peoples of Europe. Here also some rubber plantations—the only ones in peninsular India—have been established, but the industry has not yet attained great importance. In the production of rubber this region is at a disadvantage compared with other eastern rubber-producing countries because of a rather severe rainy season and the marked check to vegetative development during the winter half-year, when practically no rain falls. A superabundance of rain, when associated with high temperatures, stimulates the spread of leaf disease in the rubber trees.[13]

The east coast region of "winter" rains.—In peninsular India the land slopes gradually eastward and the longer rivers pour their water into the Bay of Bengal. In the eastern part of this area are found the Eastern Ghats, which are much lower and descend by gentler gradients to the coastal lowlands than do the mountains near the west coast of India. Thus the west coast region is hilly and highly dissected, whereas the east coast region is rolling, extremely precipitous slopes being the exception rather than the rule.

These two coastal regions of India differ not only in the character of their relief but also in amount and distribution of their rainfall. In the west coast region the rainfall is approximately twice as heavy as it is in the area of the opposite coast. In addition, in the former area it is concentrated mainly in the summer season, whereas rain in the east coast region falls not only during summer but also during the period of winter monsoon (Fig. 82). In this eastern region, winter rainfall is associated with the movement of air currents from the northeast over the Bay of Bengal.

[13] Figart, M.: "The Plantation Rubber Industry in British India," *Commerce Reports* (Sept. 29, 1924), p. 800.

Moisture-laden winds therefore impinge upon the slopes of the Eastern Ghats and lose some of their moisture in passing over this part of India.

Like the west coast region this area is an important producer of rice, which occupies more cultivated land than any

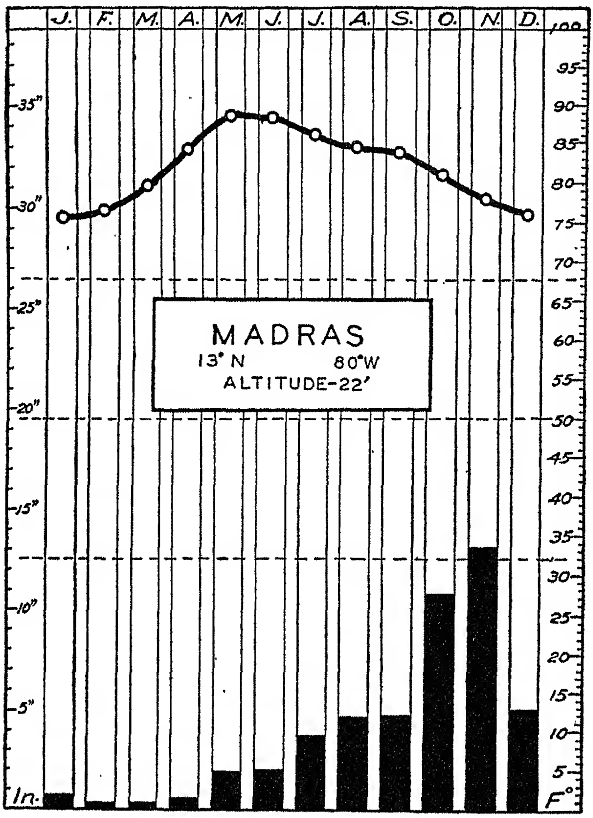

Fig. 82.—Average monthly temperature rainfall records at Madras, India. Note the striking concentration of precipitation during the fall and the early part of the winter season.

other cereal. In the production of this commodity, however, irrigation is more widely practiced in the east coast region because of the smaller amount of rainfall. As has been stated, the west coast region of India produces secondary crops such as rubber, spices, and tea; the east coast region of "winter" rain produces grain sorghums and Indian millet—

crops that are better able to grow in areas that have only a small to moderately abundant rainfall.

The east coast region of "summer" rain.—The eastern coast of India in the latitude of 16° N. changes its direction from approximately due south-north to southwest-northeast. The part of this coast located north of the sixteenth parallel therefore lies along the path of the winter (northeast) monsoon. Thus, air currents passing from the northeast across the Bay of Bengal during the winter season flow along the coast and yield but little moisture to the adjacent land. On the other hand, this region receives its greatest rainfall during the season of summer monsoon.

The crops grown in this region include not only rice, but also jowar, bajra, and ragi. Over large areas more cultivated land is given to the sorghums and Indian millets than to rice.

The Bihar and Orissa rice region.—Located north of the east coast region of summer rain and south of the lower and middle parts of the Ganges Valley, the Bihar and Orissa rice region occupies an area of rolling topography. In this region the rainfall is moderately abundant (30-45 inches a year) and comes during the period of summer monsoon.

In a large part of this region rice covers from 40 to 60 per cent of the cultivated land, and it is the most important crop for the region as a whole (Fig. 69). Other important crops include flax, the grain sorghums, and Indian millet.

The tea and rice producing highlands and basins of northeastern India.—North and east of the Lower Ganges-Brahmaputra region, level lowland gives way to highland slopes, where only a small percentage of the land is given to crops. In this area the rainfall of the summer monsoon is abundant. In fact, a part of this area—the southern slopes of the Khasia Hills—has the largest rainfall ever to be recorded (Page 176). Under such conditions of abundant rainfall, erosion is severe; and slopes lacking in forest cover are quickly washed away. Much land therefore remains in forest, and here some of the trees, especially teak and sal, have become commercially important. On the steep slopes the cultivated area

is narrowly limited to small patches of land surrounded by monsoon forest. Only in the larger basins of this part of India are the areas of cropped land continuous.

One of these basins—the upper Brahmaputra—has the distinction of being the world's greatest tea district. In this district 586 tea estates cover approximately 268,000 acres of land. Located largely in the upper part of the valley, the major tea-producing districts include Lakinpur, Darrang, and Sibsagar. In these areas most of the tea plantations are found at low altitudes. In fact, they occupy the level and rolling areas rather than the steep slopes, although some of the tea plantations are still found on the lower slopes of the hills. In this region of abundant precipitation, soil erosion is a major problem on the steep slopes, and widespread clearing of the forests is, therefore, not advisable. Thus the tea estates have tended to gravitate toward the lowlands from the higher slopes, which were occupied during the early period of tea planting in this part of India.[14]

In this region the monsoon rainfall is heavy and the summers are long, hot, and humid. As a result the growth of tea is rapid and the tea bushes may be picked from twelve to sixteen times during the wet season. This picking is done mainly by female coolies, who pick only the bud and two youngest leaves when tea of delicate quality is desired. But if quantity of yield is of chief significance, a greater number of larger leaves are picked.[15]

Agricultural production in Burma.—Although Burma is one of the provinces of India, it contrasts strikingly with India proper in various ways. In passing from India into Burma the traveler feels that he has bid farewell to the Aryan and begins to recognize the Mongol. Burma, in fact, is part of the peninsula of Indo-China just as Baluchistan is part of the dry Iranian Plateau located northwest of India. Not only is the population of Burma different racially from that

[14] Trewartha, Glenn T.: "The Tea Crop," *The Journal of Geography,* Vol. XXVIII (1929), p. 8.

[15] *Ibid.*, p. 9.

of India, but the density per square mile is much less. It is mainly because of this lower density of population that Burma has a large surplus of rice for export, whereas in general the rice of India proper does not go beyond the limits of the domestic market.

Agriculture as related to relief and climate of Burma.—Like other parts of the peninsula of Indo-China, Burma contains a series of north-south trending highlands which very markedly affect the distribution of its climatic types, agricultural land, and population. The agricultural areas conform in general to a linear pattern, in which the more productive land is found mainly in the valleys. Where the north-south trending ridges are exposed to the southwest monsoon, an abundant rainfall is experienced on the windward slopes. Such areas remain chiefly in forest, the cultivated land being given to rice. The leeward slopes and intermontane valleys, on the other hand, receive less rainfall and are therefore characterized by a different natural and cultural landscape. The effects of being located in the rain shadow of the southwest monsoon are clearly reflected in the middle part of the Irrawaddy Valley, where the native vegetation is distinctive, and a large part of the land is under the cultivation not only of rice but a variety of crops.

The rugged coastal region of Arakan.—The Arakan coastal region is located southeast of the Lower Ganges Valley, but it differs markedly from the latter in containing but little level land. Here exposure to the southwest monsoon has resulted in an abundance of rainfall, which in combination with rugged relief and narrowly limited level land, explain why a major part of the area is forest covered.

Cultivated land is found mainly in the alluvial flood plains, the area of which comprises only approximately 12 per cent of the total land surface of this region. More than 80 per cent of the cultivated land is devoted to lowland rice. The cultural landscape of these alluvial areas reflects a dendritic pattern in which each valley with its tributaries constitutes a separate unit. Here the people depend for a living not only upon the

cultivation of rice but also upon fishing. In fact, fish is a staple food second only to rice in importance to the inhabitants of this region.

A part of the coastal land of this region is given to the coconut palms, but the total area covered by these trees is less than 2,600 acres.[16]

The coastal region of Tenasserim.—Separated from the Arakan coast by the delta of the Irrawaddy River, the coastal region of Tenasserim is similar in several respects to the former coastal area. Like the Arakan coastal region, it constitutes a rugged area which trends roughly north-south, and its west-facing highland slopes are directly in the path of the southwest monsoon. Rainfall is therefore abundant. As in the Arakan region, the alluvial lands are given mainly to rice, yet there are also differences between these regions. Thus, the Tenasserim coastal region contains more coconut trees and essentially all of the rubber plantations of Burma. In addition, this region has the chief pearl fisheries and tin mines of the country.[17]

The natural landscape of the rugged coastal region of Tenasserim varies from place to place. Stretching in linear fashion along the coast, mangrove swamps are broken in places only by belts of coconut palms. Farther inland, especially where rivers and streams wind their way toward the coast, alluvial materials constitute the geographical base for paddy fields and densely populated agricultural communities. Farther east the alluvial lands give way to mountain foothills and slopes where the forest cover is broken in places only by the widely scattered rubber plantations.

Like the rubber industry of the Malabar coastal region of India, that of the Tenasserim region suffers from the lack of rainfall in winter and the superabundance of rainfall during the summer monsoon. The dry season causes leaf fall, the wet season leaf disease. Both regions, however, are fav-

[16] Murphy, M.: "The Geography of Burma," *Journal of Geography*, Vol XXX (1913), p. 22.

[17] *Ibid.*

ored by the labor factor. The Tenasserim region may obtain labor from densely populated parts of India.

The lower Irrawaddy rice region.—The Irrawaddy River has developed a large delta in its lower course. This delta is the most important rice-producing unit of Burma (Fig. 83). In fact, it contains more than 75 per cent of the total

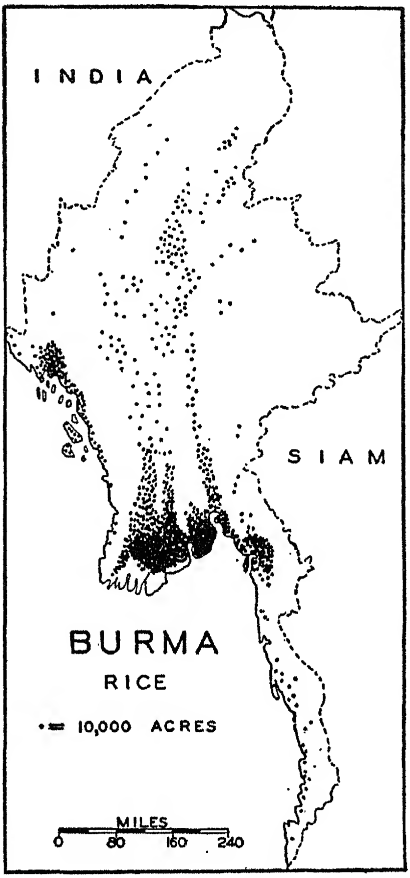

Fig. 83.—Distribution of rice acreage in Burma.

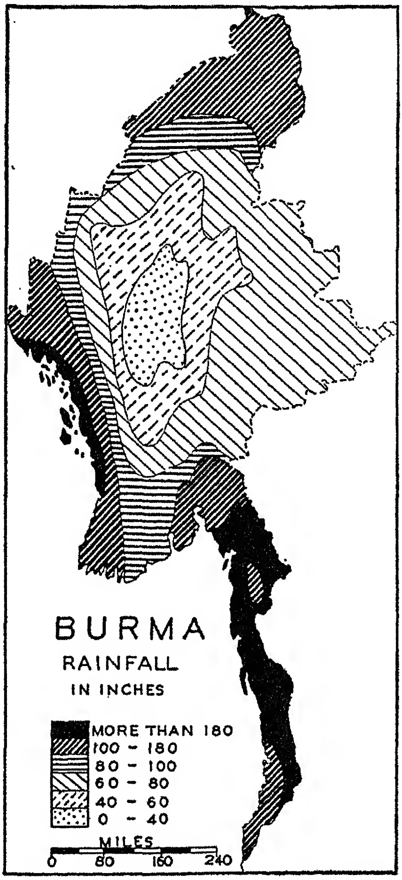

Fig. 84.—Average annual distribution of precipitation in various parts of Burma.

rice acreage of the country, approximately 80 per cent of the cultivated land of this area being devoted to this crop. The delta contains Rangoon, one of the chief rice-exporting cities of the world.

The Mandalay Basin, a mixed crop region.—Located north of the Irrawaddy delta and confined to the Middle part of the Irrawaddy Valley, the Mandalay Basin lies in the rain shadow of the coastal ranges of Burma. This basin, therefore, has a smaller rainfall than the Burmese regions that have already been discussed (less than 40 inches a year) (Fig. 84). It also contains a stunted thorn forest vegetation in contrast with the evergreen and swamp forests of the coastal regions of Burma.

In the coastal regions of Burma, rainfall is so abundant that crops other than rice cannot be grown with profit. In the Mandalay Basin, on the other hand, rice lands are watered by means of irrigation. The total irrigated area constitutes only about 12 per cent of the cultivated land of this region, and more than 90 per cent of this irrigated land is devoted to rice.

Mixed farming is the common practice. Rice occupies probably not more than 20 per cent of the cultivated land, some being grown with irrigation and some without. The other important crops, from the standpoint of acreage, include millet, sesamum, grain sorghums, beans, peanuts, cotton, fodder, and maize (Fig. 85). In general the grain sorghums, peanuts, sesamum, and cotton are grown in the upland areas of the region, where the soils are relatively dry and poor.

The Mandalay Basin is important not only from an agricultural standpoint, but it also holds a unique place in being one of India's chief petroleum-producing regions. Like many other regions which are noted for this product, the basin possesses several low domes which contain pools of oil. These were probably formed during the period of mountain making in western Burma.

The highlands of northern Burma.—From the standpoint of economic activities, the highlands of northern Burma are essentially the same as those of northeastern India. They differ from the latter highlands, however, in that they trend in general from north to south. The significant units con-

stituting these highlands are: (1) The Arakan Range; (2) the Pegu Range; (3) the Kachin Hills; and (4) the Shan Plateau (Fig. 86).

Like other low latitude highlands, those of Burma contain various climatic zones which are associated with changes in

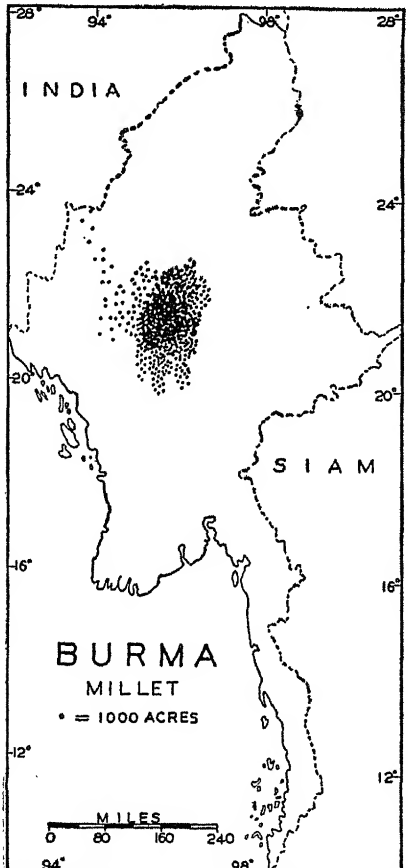

Fig. 85.—Geographical distribution of millet in Burma. Note the concentration of production in the mixed farming region of the Mandalay Basin.

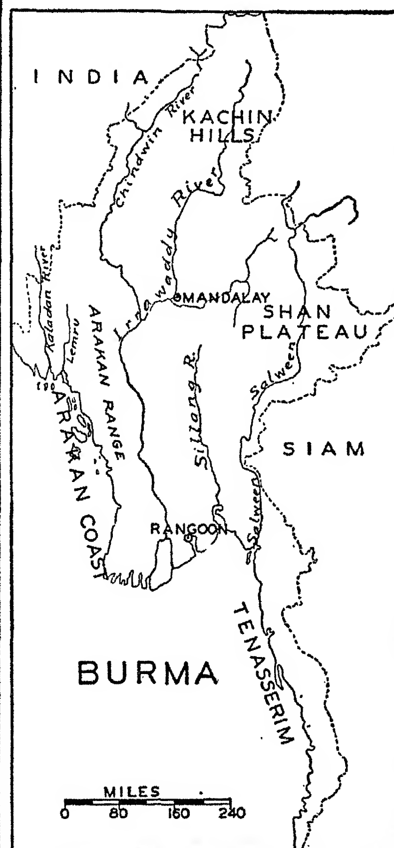

Fig. 86.—The distribution of physical features in Burma.

altitude. Where the highland slopes of Burma are cultivated they are capable of supporting, at one level or another, crops that are representative of various climatic types. In the lower parts of the highlands, especially in valleys that are

located below 2,500 feet, two crops of rice may be grown during a year. Above 2,500 feet small patches of cleared forest land are given to rice and tea. Here the climate becomes too rigorous for two crops of rice a year. At altitudes above 5,000 feet, rice and tea give way to maize, beans, peas, buckwheat, and poppies.

Agriculture in the highlands of Burma is mainly a subsistence type. Small patches of land are cleared on the mountain slopes and in the many small valleys of the highlands. These areas are sometimes devoted to cereal production for two or three years in succession, after which the land reverts to forest.

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CHAPTER XIII

Minerals, Manufactures, Transportation, and Commerce

The importance of the mineral industry to India.—In contrast to the agricultural industry, mining occupies, from the standpoint of value, only a relatively small place in the industrial structure of the country. Thus, in 1931 the total value of all minerals produced in India reached a total of $80,451,000, or an amount less than that of the single item of export, raw cotton.

Of the various minerals produced in India, coal, petroleum, manganese ore, mica, and iron ore are the most important. Yet in the production of coal, which is the leading mineral in value, India is surpassed even by the small European country of Belgium. In the production of manganese, tungsten, and mica, however, India holds a relatively high place among the nations of the world.

Coal obtained mainly from peninsular India.—In normal years India produces approximately 20,000,000 metric tons of coal, the production in 1930 being 25,236,000 tons or but little less than the coal mined in China (27,600,000 tons) during the same year. More than 90 per cent of this coal is obtained from peninsular India—chiefly the northeastern part, where southern Bengal and Bihar and Orissa are the most important coal-producing provinces. These areas contain large reserves of bituminous coal, which is used mainly on the Indian railways, in the textile mills, and in the gradually expanding iron and steel industry. In a tropical country such as India, coal for fuel is not a significant item.[1]

[1] According to various surveys that have been made, the coal reserve of India is estimated at approximately 87,000,000,000 short tons.

Petroleum production chiefly in central Burma.—Petroleum is one of the major minerals exploited in India. From the standpoint of value, petroleum ranks second to coal. More than 85 per cent of India's output of crude petroleum is concentrated in an area of a few square miles located about 650 miles north of Rangoon, in Burma. In this area exploitation began more than 100 years ago, when petroleum was obtained from hand-dug pits. While some of these hand-dug wells are still producing, the bulk of the oil is obtained with the aid of modern machinery from sands located at depths of 3,000 feet or more.

Ranking second to the Burmese fields in importance of petroleum output, the Lakhimpur district of Assam has possibilities of increased production. The refining capacity of this area has therefore been extended. But for India as a whole, it is questionable whether petroleum production will increase, since the likelihood of discovering new fields is declining.

In spite of local production of petroleum, India depends to a considerable extent upon outside sources of supply. In fact, during recent years (1928-1932) more than 40 per cent of India's total consumption of petroleum products has depended upon foreign countries. The chief petroleum products obtained from abroad are kerosene and fuel oil, these being imported in approximately equal quantities (3,000,000 barrels each) in 1930. Together these two commodities constitute approximately 85 per cent of all petroleum products that enter the country.

India a major world producer of manganese.—More than 75 per cent of the world's present manganese is supplied by India and Russia, these countries being close competitors. Within the last few years (1925-1930) Indian production of manganese has reached a total of more than 1,000,000 tons of ore annually.

In India manganese ores are widely distributed, but the production is derived chiefly from 15 districts. The principal deposits lie in the Central Provinces, and for many years

these have yielded 80 per cent of India's total production of this commodity. In these provinces the deposits are found in large lens-like structures which in some places attain widths of 20 to 50 feet and probably extend to great depths, although mining has rarely extended 50 feet below the surface. These ores have a very high metallic content. In fact, after sorting, the Indian ores contain as much as 48 to 53 per cent manganese.[2]

The outlook of the manganese ore industry of India is promising. With the large production of iron and steel in the United States, France, Germany, and England, India will continue to produce and export manganese. Not one of these major iron and steel producing countries has within its boundaries manganese deposits of sufficient size to satisfy its local requirements.[3]

Other minerals exploited in India.—India possesses one of the major silver-zinc-lead deposits of the world in the Bawdwin mine of the northern Shan States of Burma. In the large tonnage of lead and zinc ores that have been proven, India has reserves, not only sufficient for its own needs, but also for the world market. Much of the ore in the Bawdwin mine of Burma averages for each ton approximately 26 per cent of lead, 18 per cent zinc, 1 per cent copper, and, in addition, 24 ounces of silver.

The Shan States of Burma contain one of the major tungsten reserves of the world. Here the first important commercial production was made in 1910. Production increased rapidly thereafter, and by 1912 this area became the world's largest producer and remained in the lead until 1916, when it was surpassed by the United States. Within recent years there has been a noteworthy increase in tungsten production from 622 tons in 1928 to 2,452 tons in 1930. In the future, however, recourse must be had more and more to the mining

[2] Fermor, L. L.: "The Manganese Ore Deposits of India," *Memoirs of the Geological Survey of India,* Volume XXXVII, parts 1, 3, and 4, Calcutta, 1909.

[3] Furness, J. W.: "The Marketing of Manganese Ore," *Trade Information Bulletin,* No. 599, Washington, D. C., 1929, p. 18.

of those tungsten-producing districts of Burma which are more difficult of access. In most of the districts the tungsten ores contain tin. Some of the ore is treated by magnetic separators which take out the tin before the ore is exported, but usually the mixed product is shipped.

Other minerals found in India in important quantities are gold, mica, salt, tin ore, and iron ore. Gold is obtained in many of the Indian stream and river gravels, and has been worked by the Indians for a long time. Mica, a mineral used largely in the manufacture of electrical equipment, is found in many parts of India. The high dielectric quality of the Indian mica and the readiness with which it lends itself to splittings give it a predominant place in the world market. In India large quantities of salt are obtained from the evaporation of sea waters, and tin ore is obtained chiefly from the southern part of Burma (the rugged Tenasserim coastal region). Iron ore, occurring chiefly in the form of iron oxides, is obtained in the northeastern part of peninsular India in the general region of maximum coal production.

The status of manufacturing in industry.—Although India may be described as an agricultural rather than a manufacturing country, it is not absolutely lacking in the arts of modern civilized life. India has no swarming hives of modern industry to compare with the factory centers of northeastern United States, or of England, Belgium, France, and Germany. Yet owing to its large total population there are perhaps at least three times as many people engaged in manufactures in India (about 35,000,000) as in the British Isles. But India has not reached that stage of industrial development in which the large manufacturing plants predominate in the cultural landscape of urban centers. On the other hand, home industries and workshops are widely distributed, and these have reached a high degree of artistic taste. Hindu society demands that the necessary arts, such as those of the weaver, the potter, and the smith should be practiced. The pride and display of the rival kingdoms into which the country was formerly divided gave birth to many arts of luxury

that have not been entirely forgotten in the decayed capitals.

Chief factors affecting manufacturing in India.—Geographical factors alone do not explain the status of industry in India. No one can fully understand the national economy or interpret the industrial status of that country without also considering factors such as religion, caste, language, family, and education. Yet the environmental factors are basic to the economic adjustments of India's millions, and the country possesses a variety of natural resources as well as a diverse geographical base for agricultural production (Fig. 68).[4] First in the world as a producer of jute, second in the production of cotton (4,500,000 bales) and sugar (3,500,000 tons), and a ranking commercial producer of tea, rice, and spices, India holds an important place among the nations of the world in agricultural production. These commodities in turn have given rise to the development of cotton mills, jute mills, sugar mills, and tea factories. Moreover, in normal years India ranks second only to Russia in the exploitation of manganese and possesses large reserves of coal and iron ore. Yet she has but four iron and steel plants of the modern type and fewer cotton spindles than the single state of South Carolina.

One of the chief factors affecting the relatively slow growth of modern industry in India is found in the history of that country. When the first European traders reached the coast of India in the sixteenth century, they found a civilization about as highly advanced as their own. In architecture, in the manufacture of cotton and silk fabrics, and in goldsmith's work the people of India were far advanced. But while the East has stood almost still, the West has advanced with gigantic strides unparalleled in the history of human progress. This stagnation of development in India has been due in part to the downfall of the native courts, which constituted the peoples' chief markets. Moreover, the English capitalist has enlisted in his service forces against which the village artisan of India found it difficult to compete.

[4] Bergsmark, D. R.: "The Geographical Regions of India," *Journal of Geography,* Vol. XXVIII (1929), pp. 108-122.

Another major factor affecting India's industrial status is diversity in culture, religion, and language. In no other equal area in the world may one find a population of more than 350,000,000 people divided to such an extent into distinct and independent communities. Religion plays a very important part in the lives of the people of India. In some places it divides the people into separate and often hostile communities. Hindus and Moslems often look upon one another with suspicion and antagonism, and this to the detriment of industrial development.

The caste system also acts as a detriment to modern industry. In some cases members of one caste are not permitted to touch objects which have been touched by those of a lower caste, and the refusal of members of different castes to work together and the restriction of certain castes to do certain kinds of work promote economic waste and inefficiency. There has been some breaking down of the caste system, however, and a tendency for the adoption of ideas and practices in accord with those of our western civilization.

Modern industry further demands intelligent workers, a condition not found in present-day India. Most of the natives can neither read nor write, and it is estimated that there are only 2,500,000 who can read and write English.[5] This condition is further aggravated by the great number of languages. According to the reports of various committees and of the Indian Census, there are twenty-two different languages, each of which is spoken by a population of more than one million and each as different from the rest as English is from French.[6] Attempts are made, however, to make Hindustani the common language of India.

Cottage industries.—Historically the most interesting, and still the most important in the aggregate, of all Indian industries are those conducted in every rural village of the land.[7]

[5] *Reports on the Census of British India*, Calcutta.

[6] *Report of the Reforms Enquiry Committee*, London, 1924-1927.

[7] Throughout India the peasants live in villages of mud huts and have done so for the past 3,000 years. Eighty per cent or more of her population lives in these villages. There are 500,000 mud villages.

Cottage industries are the chief source of money for the villagers, whose little patches of land merely supply them with food. The weaver, the potter, the blacksmith, the brazier, and the oil-presser are each members of a community as well as inheritors of a family occupation. On the one hand they have a secure market for their wares, and on the other their employers have a guarantee that their trades shall be well learned.

The textile industry is the most widely distributed of all the cottage industries of India and is the occupation in which her craftsmen have shown their highest achievement. Some of the products of the looms of Bengal are marvels of technical skill and perfect taste, and the old Cashmere shawls are in a class by themselves. However, weaving is essentially a process of repetition and was one of the first industrial activities to which machinery was applied. But modern science has brought the power loom to such a high state of perfection that many of the most beautiful varieties of Indian textile work have disappeared, killed by the competition of the power loom.

It is the cottage textile industry that is being advocated by Ghandi as one means of breaking down British power in India. Ghandi advocates the establishment of cotton spindles in as many homes as possible, and the manufacture locally of India's large cotton crop. Thus, instead of exporting raw cotton—a commodity that is normally first among the exports—India is planning to manufacture her own cotton textiles. If it is thoroughly executed, such a plan would have far-reaching influences, since India generally provides the United Kingdom with an abundance of raw cotton and receives cotton goods in return. In fact, during normal years cotton textiles constitute the leading item among the commodities imported into India.

In the domestic industry the weavers are usually connected with agricultural activities in some way. They till their crops, and work their looms during off seasons or in their spare time. Many of the people are so poor that they do

not own looms, but rent these from a trader or dealer who also furnishes yarn and buys the cloth. These traders thereby take a substantial profit on both ends.

It is generally admitted that it is cheaper for Indians to buy machine-made cloth, but many believe that a back-to-the-spinning-wheel-and-hand-loom-movement is what India needs to relieve much of the distress of her agricultural peoples, who constitute 75 per cent of the total population. It is claimed that the farm work does not keep the rural people busy all the time and that hand spinning and weaving give the farmer a supplementary occupation; and some maintain that the distress in the villages of India is caused principally by the decline of the hand-loom industry and the growing imports of cotton piece goods from foreign countries. It is, moreover, quite questionable whether highly specialized factory pursuits and large-scale production in all lines are to be desired in this vast realm with its low purchasing power, large agricultural population, high percentage of illiteracy, and diversity of languages.

It appears that the cotton textile industry will continue to expand. The country has the raw material, the domestic market for the finished products, and a relatively cheap and abundant labor supply.

The Indian cotton cloth consumption.—One of the chief reasons for India's large cotton textile industry is the tremendously large home market. It is estimated that no less than 5,000,000,000 yards of cotton cloth are consumed in India annually. Cloth is the one product bought by every inhabitant, and cloth shops are found in all parts of the country; in fact, in places where dealers in other merchandise would not attempt to sell.

The low purchasing power of the average Indian, together with the tropical climate, suggests the wise choice of light-colored, coarse clothing.[8] By reason of the extreme heat in most parts of the country during the greater part of the year,

[8] An official committee recently estimated that the average income of the Indian farmer probably does not exceed the equivalent of $25 a year.

light clothing is necessary; and the national dress for men, the so-called "dhoti," is nothing more than four or five yards of plain, light cotton cloth wrapped about the loins. For women a greater yardage is required, since the cloth is wrapped around the entire body in the form of the well-known sari, the styles varying in different sections of the country. The regional variations are characteristic also of the dress of the men. Thus the Bengalese in Calcutta, dressed in a dhoti and shirt with the tail hanging on the outside, appear quite different from the Indians of Madras, who arrange their dhotis in an entirely different manner. Hindus, Mohammedans, Sikhs, and various peoples have their peculiar forms of dress, but in all cases little if any sewing is required to change several yards of cheap cotton cloth into an article of wearing apparel. In sections of India where it is comparatively cool during a few months of the year the people use more cloth in their garments. It is in these sections that second hand wool clothing, principally from the United States, is worn. A few Indians have adopted Western styles and others have been influenced by them, but the number is small. The great demand for cotton cloth continues to come from the Indians who retain their own or native form of dress.[9]

The modern factory.—Although about ten per cent of the people of India are engaged in some type of manufacture, less than one per cent constitute members of organized industry. But modern manufactures have increased rapidly during recent years. Textile weaving is the most productive activity and is represented by nearly 3,000 factories employing approximately 800,000 organized workers. This industry has reached its chief development in Bombay. The number of cotton mills increased from 194 in 1900 to 306 in 1927. Jute mills more than doubled (36 to 93) during the same period.

Cotton textiles.—As India's greatest modern industry, the manufacturing of cotton textiles gives employment to nearly half of the textile workers engaged in factory production, most

[9] *Commerce Reports* (Jan. 4, 1932), Washington, D. C., p. 35.

of the remainder being employed in the manufacture of jute (Fig. 87).

The first successful cotton textile plants were started in 1853, but expansion was slow indeed until the last quarter of the nineteenth century. From the first period of its development, this industry was financed and controlled by Indian

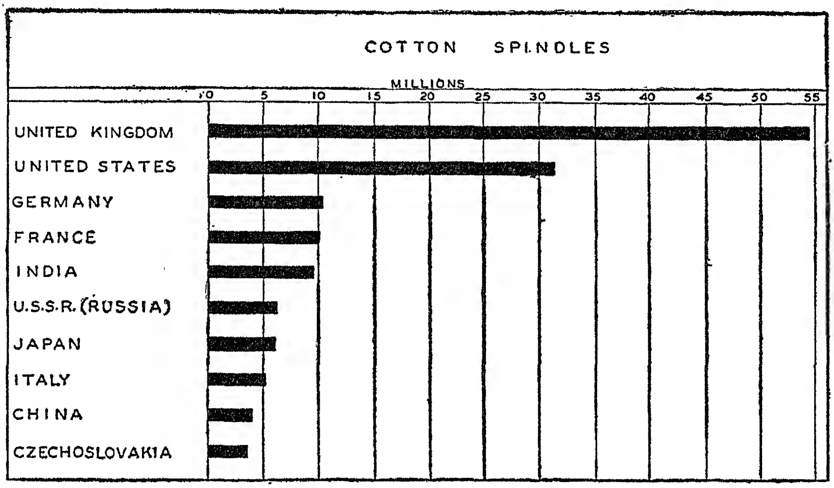

Fig. 87.—Ten leading countries in total number of cotton spindles in 1931.

capital, although very often European managers were employed. These modern Indian factories obtained a monopoly of the intermediate grades of cotton goods, the coarsest as well as the finest cotton fabrics being woven by hand.

Bombay is the chief center of the cotton textile industry. It contains about two-thirds of all the workers. The importance of cotton textile manufacturing in this center is due to a combination of various factors, among which are: (1) proximity to the cotton-producing region of west central India; (2) position with respect to Europe; (3) damp sea breezes, an important factor where humidifiers are generally lacking in the industrial plants; and (4) favorable railway contacts with other parts of India.

The jute industry.—The jute industry of India is also of major importance. At present jute manufactures constitute

the second item of the export trade. Jute products are sent to the sugar fields of Cuba, to the quebracho lands of Paraguay and Argentina, and to the grain fields of the United States, Canada, Australia, and Europe.

Although raw jute was exported from India as early as 1822 to Dundee, Scotland, it was not until 1838 that the first regular export of this commodity began. When the supplies of flax and hemp fiber were cut off by the Crimean War, the raw jute of India took the place of these commodities on the Dundee market. The improvements that resulted from this stimulus to jute exports from India caused the Indian jute to supplant permanently the Russian materials.

Raw jute was exported until 1854, when the East Indian railroads began to demand coal in moderately large quantities, which led to the opening of the Raniganj coal field. With the increase of coal exploitation, jute mills developed in the vicinity of Calcutta on the banks of the Hooghly River and jute manufactures became increasingly more important. At first these jute products were inferior in quality to those of Dundee; yet the industry continued to develop until 1908, when the jute output of the Indian mills had definitely passed that of the mills of Dundee. The Indian jute manufactures were further stimulated during the World War by the demand for sand bags, and during the period 1925-1933 jute manufactures and raw jute ranked second and third, respectively, among the exports of the country.

Calcutta and vicinity constitute India's chief jute manufacturing center. Here a combination of factors favors development, among which are: (1) proximity to raw material; (2) large amount of cheap labor; and (3) favorable location for export trade.

Minor textile industries.—Woolens have been manufactured in India for a long period of time, but this industry at present is relatively small. Yet some progress has been made during the last two decades: an increase of woolen mills from six during the pre-war period to eighteen in 1927. These mills have approximately 2,000 looms and 92,000 spindles.

Most of the mills are engaged in the production of blankets, the manufacture of finer woolen and worsted goods being handicapped by the poor quality of the Indian wool. In fact, it is perhaps correct to say that approximately half of the breeds of sheep in India yield a kind of hair rather than wool.

Iron and steel industry.—India contains only four modern iron and steel works: (1) the Tata Iron and Steel Company; (2) the Indian Iron and Steel Co., Ltd.; (3) the Mysore Iron Works; and (4) the Bengal Iron Co. The Tata Iron and Steel Co. is located at Jamshedpur, about 155 miles west of Calcutta. Here the company draws upon large reserves of raw materials which are available within a radius of 100 miles from the plant. The iron ore of the region has a metallic content of more than 60 per cent. The Indian Iron and Steel Company began operation in 1923, and at the present time produces only pig iron. These works are located 142 miles from Calcutta. The Mysore Iron Works are property of the Government of Mysore. They are located at Bhadravati. This company produces charcoal iron, which is used in the manufacture of chilled castings, malleable castings, and special steels. The Bengal Iron and Steel Company consists of five blast furnaces located 144 miles from Calcutta on the East Indian Railway.[10]

Until 1922 the iron and steel industry of India flourished, but unfortunately the world prices of steel fell. The Tata works were caught holding long-time contracts at prevailing market rates. The company therefore appealed to the Government and obtained a tariff of 25 per cent on imported steel and a bounty on all finished steel products. In 1927 a seven-year duty was imposed on all imported steel. It was lower than the previous duty in respect to British steel but higher in general on all other steel. In 1934 a continuance of the protective policy gave further assurance of development at this plant. In fact, it has recently been able to put pig iron

[10] Howard, George C.: "Iron and Steel Industry and Trade of India," *Trade Information Bulletin*, No. 816, Department of Commerce, Washington, D. C., 1933.

on the market at approximately one-half the cost of European pig iron, a condition made possible in part because of the proximity to high grade iron ore (the ore averages more than 60 per cent pure metallic content).

The principal iron and steel products manufactured in India include rails, steel sleepers, fishplates, structural sections, bars, plates, and black galvanized sheets.

Inadequate transportation facilities.—As in the major part of Asia, in India transportation facilities are inadequate, and some of the peripheral parts of the country have practically no land contacts with the central areas. Thus, from the standpoint of transportation by land, the Indian province of Burma is essentially isolated not only from peninsular India but also from other parts of the mainland of Asia. Communication with the outer world is almost entirely by water, because of the wild, rugged highland frontiers which make the construction of railways and roads impracticable. Similarly, the roads and railroads of the Indo-Gangetic Plain are limited on the north by the Himalayan and Hindu Kush Mountains. Only where low breaks or passes are found has transportation been extended to trans-mountain areas. Thus, in the northwestern part of India the Khyber and Bolan passes have been used by traders as well as warriors, and have played a prominent role in the history of the country.

For India as a whole, commercial progress has been retarded by the small mileage of roads and the high cost of bringing the country's resources to marketable centers. Rivers and canals are but little used, except the waterways in the delta regions. Railways constitute the chief means of transportation, and have been a major factor in the commercial development of the country.

Railways the backbone of India's transportation system.—Although India ranks fourth among the nations of the world in total railway mileage, there is ample room for further development of this type of transportation. With only 23 miles of line for every 1,000 square miles of land, India has only 27 per cent as much railway line as has the United

States. From the standpoint of railway mileage as related to population density, India is even more poorly equipped as compared with our country. In fact, for India as a whole there is only 1.3 miles of line for every 10,000 people.

Along the 42,813 miles of railway line completed by 1932 in India, there has developed a strip of country approximately 20 miles wide—10 miles on each side of the line—which has become important in producing commodities for the local markets as well as for the commercial world. Outside of this 20-mile strip of land the cost of transport is so great that the economic activities are directed almost entirely on the production of commodities for the local markets. Here large areas await the development of cheap and efficient means of transportation.

The railways of India are owned mainly by the central government, 31,517 miles being Imperial State lines. The remaining 10,764 miles belong to Indian states and private companies. Both groups of railways—state and privately owned—have played a major part in developing plantation agriculture, in speeding up relief during famine years, and in hastening industrial development in various parts of the country. These railways are used mainly in carrying goods that are of bulky nature, especially commodities that are low in value compared with weight. In addition, the widespread poverty of the great masses of people in India means that passengers use low class (third class) equipment, which is generally inferior to that of the same class in European countries and in the United States.

Roads.—Of India's 250,000 miles of metaled (water-bound macadam) and unmetaled road, approximately 225,000 miles are found in British India and 25,000 miles in the Indian states. Throughout the country the roads not only serve as important connecting links between centers that are not connected by other means of transport, but they also serve as important feeders to the railways. As the latter developed it became increasingly necessary to build roads to feed them rather than to compete with them; and this in turn led to

a demand, which remains to-day, for metaled roads that would give access to the railways throughout the year. The construction of roads serviceable throughout the year is urgently needed in order to make large areas available to railway transportation. There still exist in many parts of the country a large number of railway stations that are entirely inaccessible to a loaded cart for five months of the year. Under such conditions the railway confers no practical benefit—except in a small way—on the districts through which it runs.

There are several major handicaps to road development in India: (1) bullock carts cause excessive wear; (2) heavy rains of the monsoon cause inundations and washouts in many areas; (3) the meagerness of funds is a serious check to future construction and improvement. Instead of establishing a department and a national policy pertaining to highways, the Government of India has left road policy, construction, and repair to the several provinces.[11]

Commerce.—From the foregoing description of the economic status of the various parts of India, it is evident that the country is well equipped with the materials that go to build up commerce. The products of the geographical regions of India are sufficiently varied to encourage domestic trade, while certain materials are produced in excess and therefore are exported in exchange for products lacking at home or for commodities produced more cheaply elsewhere.

Importance of India in world trade.—India's importance in international trade is not generally realized outside of foreign trade circles. The huge population makes possible a large total trade even though the purchasing power per capita is low. In fact, during normal years her total world trade places her among the first eight countries of the world. Of the major trade divisions of the world she ranks, with Canada and eastern Asia, as a unit of secondary rank; and, considering the relative poverty of her inhabitants, her rank among the nations of the world is noteworthy.

[11] U. S. Department of Commerce: *Commerce Reports* (Sept. 29, 1924), pp. 782 and 783; (May 13, 1929), Washington, D. C., p. 387.

Exports normally exceed imports in value.—One of the striking features of Indian trade is the excess of exports over imports (Fig. 88). Thus in 1930 India exported commodities valued at \$919,000,000, whereas the imports amounted to only \$674,000,000. A study of Indian trade statistics over a

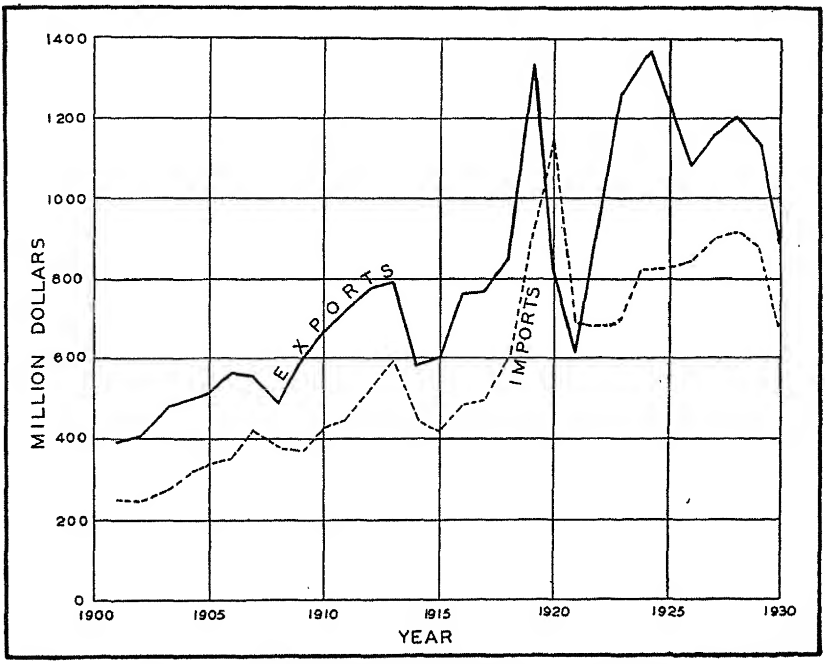

Fig. 88.—Indian export and import trade since 1900.

period of many years discloses a similar relationship: an excess of exports over imports. This trade, however, is balanced in another way: through services of various kinds that may be classified as invisible items of import (banking services, shipping services, etc.), and these invisible items are paid in terms of commodities exported. Irrigation projects and railway equipment are financed in a similar manner.

Exports consist mainly of agricultural products.—The most striking feature of Indian export trade is the preponderance of agricultural products. Of these the textile raw materials rank first in importance, raw cotton normally being

the leading item of India's export trade (Fig. 89 and 90). Other important agricultural exports include grain, especially rice exported mainly through Rangoon, Burma, and oilseeds,

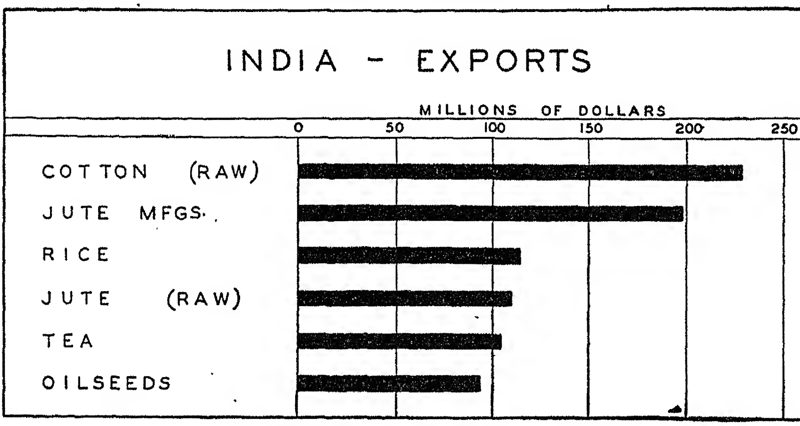

Fig. 89.—Leading merchandise exports of India.

mainly through Bombay, India; still others include tea, raw jute, hides and skins, and raw wool.

Manufactured products, on the other hand, occupy a relatively small place among Indian exports. Only jute manufactures are important (gunny bags and gunny cloth). Cot-

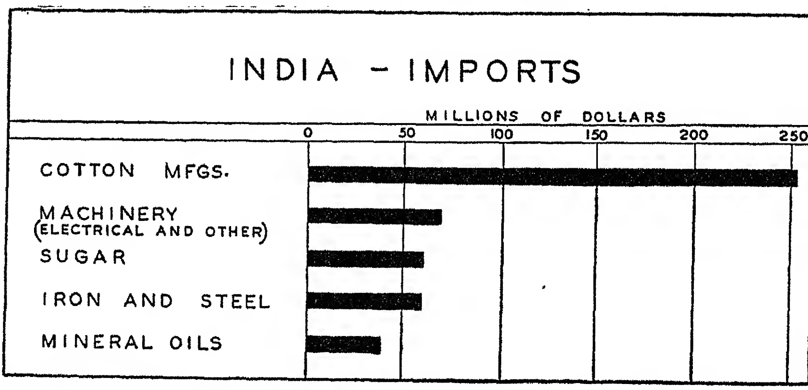

Fig. 90.—Leading merchandise imports of India.

ton textiles, though important in the domestic trade, occupy a relatively small place among the exports, only $12,200,000 worth of cotton piece goods being exported annually during

the period 1929-1932, whereas the imports of that commodity were valued at $99,700,000.

Direction of India's trade.—Four countries—the United Kingdom, Japan, the United States, and Germany—together take approximately 52 per cent of all goods exported (in value) from India and supply her with more than two-thirds of her imports (average 1928-1932). By reason of its superior market and by virtue of its administrative advantage, Great Britain has been able to maintain its dominant trade

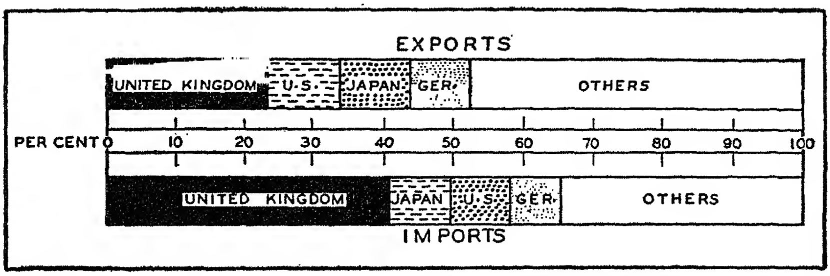

Fig. 91.—Chief markets of India's exports and the leading sources of imported merchandise.

position in India. However, Japan, the United States, and Germany have been strengthening their position in this large and expanding market (Fig. 91). This has been especially noteworthy in the past few years.[12]

India constitutes an attractive market for American goods, since each country has what the other needs, creating a natural and sound basis for exchange. Among the most important commodities obtained from India are jute, shellac, tea, hides and skins, seeds, gums, and other raw materials that are demanded by American industries. In general the commodities obtained from India are unobtainable in our domestic market. On the other hand, Indian imports from the United States include automobiles, specialities, mineral oils, typewriters, adding machines, and various other high-grade and semi-luxury wares, the demand for which is largely confined

[12] In 1928 the United States supplied India with 6.9 per cent of total Indian imports; in 1929, 7.3 per cent; in 1930, 8.2 per cent; 10.6 per cent in 1931, and 8.8 per cent in 1932.

to the wealthy classes. Yet there is an ever-increasing tendency to extend various types of goods to the greater Indian market, as reflected in imports of American canned goods, razors, electric household appliances, and many other lines.[13]

Trade across the Indian frontier.—The greater part of India's foreign trade is by way of the sea, the trade across the land boundaries being but a small fractional part of the total. Most of this land trade—both export as well as import—extends across the eastern frontier, and takes place mainly with the Shan States, southwestern China, and Siam. Next in importance from the standpoint of Indian exports are the countries located across the northwestern frontier, where Afghanistan and Persia constitute markets for Indian goods. Commerce is also well established to the north of India, especially with Nepal.

The chief ports of India.—India's foreign commerce is strikingly concentrated at five ports—Calcutta, Bombay, Karachi, Madras, and Rangoon. Each of these ports is distinctive in the export of some commodity, and each functions as a major trade center for some large part of the country. Thus Calcutta is distinctive by reason of her vast export of raw jute as well as jute manufactures; Bombay serves as the chief outlet for India's major cotton-producing region; Karachi is the noteworthy outlet for Indian wheat; Madras serves southeastern India; and Rangoon is one of the noteworthy rice exporting ports of the world.

Located on the Hooghly River, one of the distributaries of the sacred Ganges, and 82 miles from the Bay of Bengal, Calcutta is one of the great ports of the world, serving a rich consuming as well as producing hinterland, the great Ganges Valley. As the leading outlet on the Bay of Bengal, it serves commercially a number of political divisions, including Bengal Presidency, Bihar and Orissa, Assam, the United Provinces, the northern section of the Madras Presidency, and the frontier areas of Nepal and eastern Tibet. It is the shipping

[13] Chapman, Emmett A.: "India's Place in World Trade," *Commerce Reports* (Feb. 13, 1928), Washington, D. C., pp. 401 and 402.

center for more than 90 per cent of the world's commercial jute, and also exports large quantities of tea, shellac, and oil seeds.

The port, however, is not without its disadvantages, among which the most striking is the difficulty of navigating the Hooghly, a notoriously difficult and dangerous river. In fact, skilled pilots must be used in guiding vessels through this strip of water. Because of the numerous bars between Calcutta and the open sea, vessels drawing more than 30 feet of water can be handled only at the height of the ordinary spring tides.

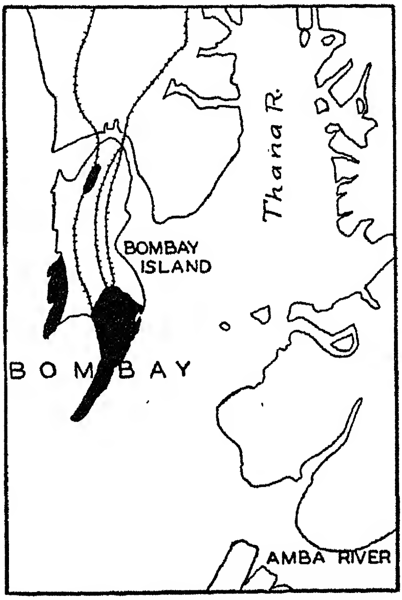

Fig. 92.—The port of Bombay.

In order to take care of her large volume of traffic, Calcutta is provided with all the facilities commonly found in a first-class port. Here modern jetties have been constructed, such as the Garden Reach jetties. King George's Dock, a relatively recent addition to the port (1928), two tea warehouses, a hide depot, and a seed depot are among other mechanical facilities which enable Calcutta to function as one of the greatest of Asia's ports.[14]

Bombay is located on Bombay island, which is connected by a mound with the large island of Salsette (Fig. 92). These together with two or three other islands jointly enclose with the mainland one of the most expansive and commodious harbors in Asia.[15] Although the site itself—the harbor and immediately adjacent land—is favorable for port development,

[14] See *Commerce Reports* (April 22, 1929, and Nov. 3, 1930), Washington, D. C.

[15] The name Bombay is believed to have been suggested by the Portuguese term bom bahia, meaning good harbor.

the elements of situation further aided the growth of Bombay, especially its situation with respect to the area of most concentrated Indian cotton production. Its railway connections with the interior are very good; and Bombay functions therefore not only in the cotton trade, but also in handling various commodities produced even as far north as the Ganges Valley. For example, much of the flax seed produced in north central India finds an outlet to the markets of Europe through Bombay.

Karachi, Madras, and Rangoon handle most of the remainder of India's foreign trade. Karachi owes its importance to location in the lower, seaward side of the Indus Valley, and is therefore significant mainly because of the cotton and wheat of the Punjab and the cotton of Sind. The commercial importance of Karachi is increasing as a result of the opening of new and irrigated lands in the Sind and Punjab. With a population of more than 500,000, Madras is the third largest port of peninsular India, being located approximately 1,000 miles southwest of Calcutta. Unlike Bombay, Madras has no natural harbor, being situated on a uniform coast where the shore is quite sandy. After extensive improvements and the introduction of modern mechanical facilities, the port now takes care of a large trade, consisting mainly of exports of leather, hides and skins, cotton, tea, spices, and imports of manufactured goods and machinery. As the leading commercial city of southern India, Madras has good railway service to Bombay and Calcutta. Rangoon, located 20 miles from the sea on the Rangoon River—a distributary of the Irrawaddy—is the chief port of Burma. Through it passes 98 per cent of the exports of this Indian province. The significance of rice exports through this port is clearly reflected in the fact that Burma is largely a one-crop area, in which rice normally accounts for more than three fourths (by volume) of all commodities exported.

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CHAPTER XIV

Ceylon

Distinguishing characteristics of Ceylon.—Located near the apex of the Indian peninsula and in the pathway of shipping between Asia and Europe, Ceylon possesses a favorable geographical position. Separated from India not only geographically, but politically and economically as well, this pear-shaped island with its 25,332 square miles of land is a Crown Colony of the British Commonwealth. Palk's Strait, the channel separating Ceylon from southern India, contains a row of islands and sand banks, with shallow intervening waters. This channel is traversed by fast ferries which carry traffic between Dhanuskodi, India, and Talaimannar, Ceylon.

Physically, the island is composed mainly of level to gently undulating topography, with a mass of mountains in the south-central part, where Mt. Pidurutalagala reaches a height of 8,296 feet and Adams Peak, more conspicuous and noteworthy, attains the height of 7,353 feet above sea level. These highlands consist of old, hard, crystalline rocks similar to those of the Deccan of India, whereas the rocks of the coastal plains have been covered with materials brought down from the highlands and by laterite, the characteristic soil covering of humid tropical lands. The laterite, however, is also found in the form of a cellular-textured rock, locally known as kabuk, a material of which the so-called "red roads" of Colombo are made. In the wider valleys thick beds of recent alluvium constitute a very favorable geographical base for agricultural activities. In the northern part of Ceylon lies a narrow band of sedimentary rocks, whereas the Jaffna Peninsula consists of recent marine limestone and coral.[1]

[1] Turner, L. J. B.: *Handbook of Commercial and General Information for Ceylon,* Government Printer, Colombo, Ceylon, 1927, p. 2.

Controlled very largely by the action of two monsoon winds —the southwest and the northeast—the climate of Ceylon, though tropical, is on the whole fairly good as compared with the climate found in many other tropical countries. In April the southwest monsoon shows signs of setting in, becomes more definite in May, increases in force towards the end of May, is well developed in June and July, shows diminished force in August and September, and by October the northeast monsoon begins to manifest itself. After blowing from October to February, the latter monsoon gradually gives way to a transition period which lasts until the southwest monsoon again makes its appearance.

With a population of 5,312,000, or 210 per square mile, Ceylon has a relatively great density, of which not more than 12.7 per cent may be classified as urban. The population is mainly Singhalese, but large numbers of Tamils from southern India are employed on the estates. A record of the country's past discloses the fact that the Singhalese came to the island from northern India (about 543 B. C.), conquered the aborigines, and later accepted Buddhism, when it was introduced in 246 B. C. The Singhalese suffered for centuries from raids by Tamils who came from southern India; and today Singhalese and Tamil are the two chief languages of the native population, although English is widely spoken and is taught in the schools, being the only language considered of commercial importance.

Geographical regions.—The natural environment of Ceylon varies from place to place. This variation in environment is in harmony with the regional differences in human activities. Three regions may be recognized: (1) the highlands; (2) the maritime region; and (3) the northern lowlands.

The highlands.—The south-central part of Ceylon is made up of a roughly circular highland, located mainly above the 1,000-foot contour, and comprising a series of ridges which are separated in some places by deep valleys (Fig. 93). In these highlands the monsoon winds are intercepted and expend their moisture, thereby giving the region an abundance of precipi-

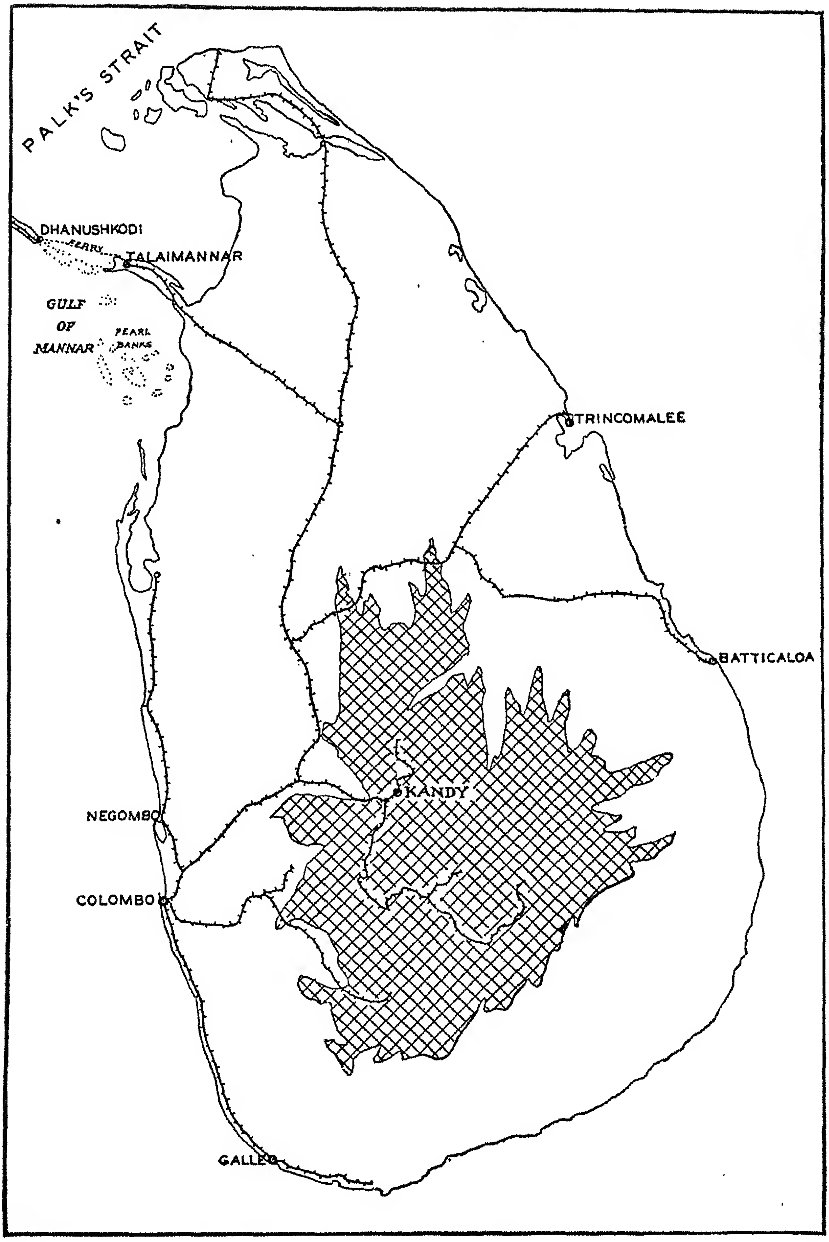

Fig. 93.—Map of Ceylon showing railways, relief, and chief ports. Shaded area constitutes land that is more than 1,000 feet above sea level.

tation, periods of dense clouds of mists, and a luxuriant vegetative cover. The abundant precipitation has favored the development of tropical evergreen trees as the chief type of native vegetation, but at altitudes above 5,000 feet the trees are generally too small to be commercially significant.

In the highland region, climate, relief, and drainage favor tropical agriculture, and the plantation system is well developed. In fact, this is Ceylon's chief tea, rubber, and cacao producing region. Here tea, rubber, and rice, in the order named, are the most widely cultivated plants.

The tea industry.—In the highland region tea plantations cover more than 40 per cent of the cropped land. Of the plantation enterprises of Ceylon as a whole, this industry generally leads all others, tea normally being the chief export of the island. Together with the Indian teas, those of Ceylon have taken a leading position in world markets.

The environment of the highlands favors the growth of the tea industry. High temperatures, long growing season, and abundant and well-distributed rainfall enable a continuous and rapid growth of new tender shoots (Fig. 94). Since there is no dormant season for the tea bush, picking continues throughout the year. Here also the slope lands are sufficiently well drained—another important requirement for successful tea growth.

Ceylon's teas are mainly black (only small quantities of green tea are produced) and are manufactured from the young, tender shoots of the leaves of the bush technically known as *Camellia thea*. The plucked leaves are sent immediately to the factory, which is generally located on and even belongs to a given estate. In the factory the leaves are withered, rolled, fermented or fired, graded, and packed for the market.[2]

The tea industry requires a large number of workers. On the plantations it needs considerable attention in cultivation; the bushes must be pruned frequently, and plucking operations are carried on entirely by hand. In the factory consid-

[2] Green tea is manufactured by steaming instead of withering the leaves, and the fermenting process is omitted.

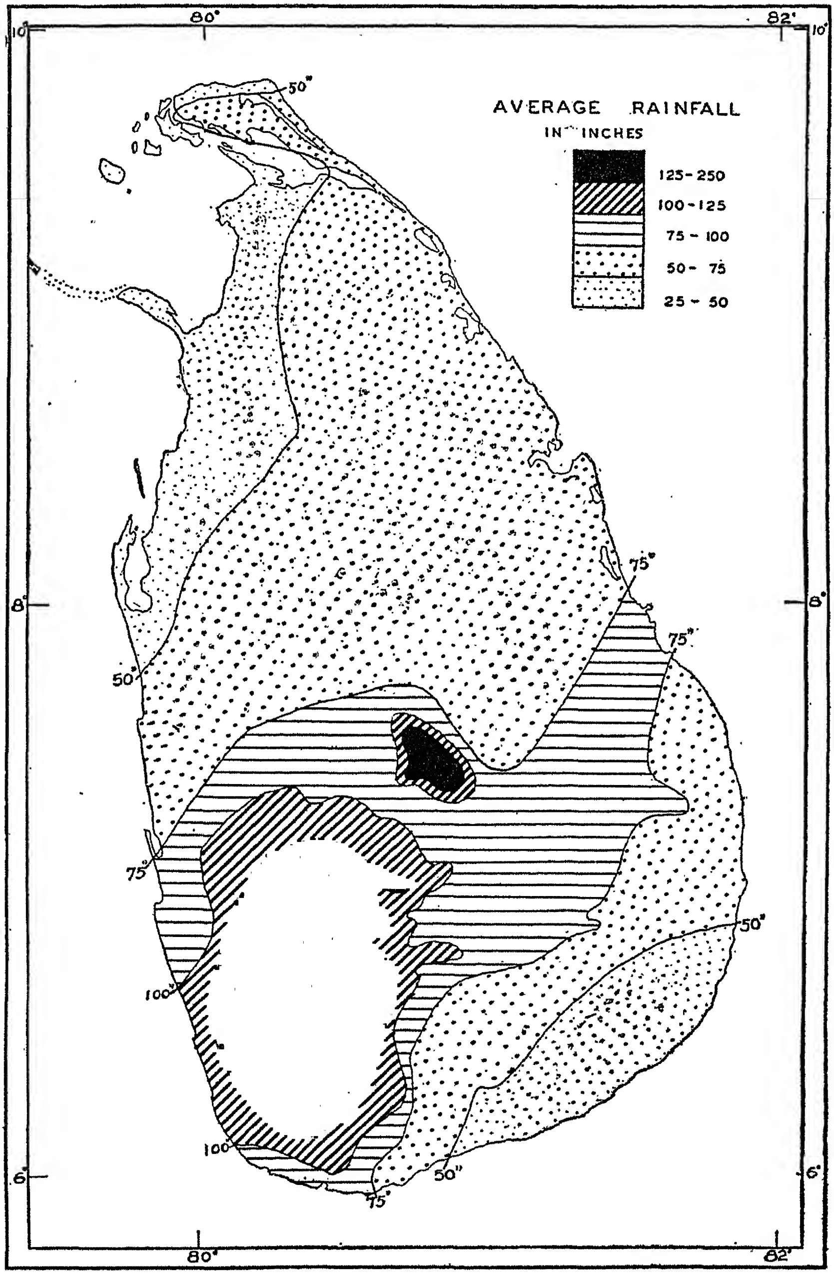

Fig. 94.—Distribution of annual average precipitation in Ceylon.

erable manual labor is required in sorting and packing.[3] More than nine-tenths of the tea-estate labor consists of Tamils from southern India, whereas Singhalese contract labor is employed in some districts. On the plantations usually one laborer per acre is required in tea cultivation and he is paid at the rate of from 15 to 27 cents (American money) per day.

The rubber industry.—Rubber is next only to tea in acreage in the highland region, and for Ceylon as a whole it is second to tea among the exports. A study of the relief and crop distribution maps (Figs. 93 and 95) shows that rubber generally thrives at elevations below 2,000 feet and is therefore well suited to those areas of highland Ceylon not adapted to tea gardens, since tea grows better above the 2,000-foot contour. Rubber plantations, in fact, extend beyond the foothills and lower slopes of the highlands into the maritime region, and they reach their greatest development in the humid southwestern part of the island (Fig. 95).

Rubber also requires large amounts of labor for planting new trees, cultivating the ground, collecting the latex, and preparing the product for the market. The situation is generally satisfied by immigrant Tamil labor, although some use is made of Singhalese, who do good work as tappers. One coolie to three acres is the usual labor requirement, and about half the wages on rubber estates are paid on the piecework basis.

The importance of Ceylon's rubber industry to the United States is reflected in the fact that the latter country normally takes more than 60 per cent of all the rubber exported from the island. However, no rubber land in Ceylon is owned by Americans, but American manufacturers purchase in the Colombo market.

Other crops in the highland region.—Rice and cacao are other important agricultural products of the highland region. Rice, the important food of the Singhalese and Tamils, is widely cultivated and takes a significant place in the national

[3] Turner, Mason: "Ceylon," *Trade Information Bulletin*, No. 601, Washington, D. C., 1929, p. 4.

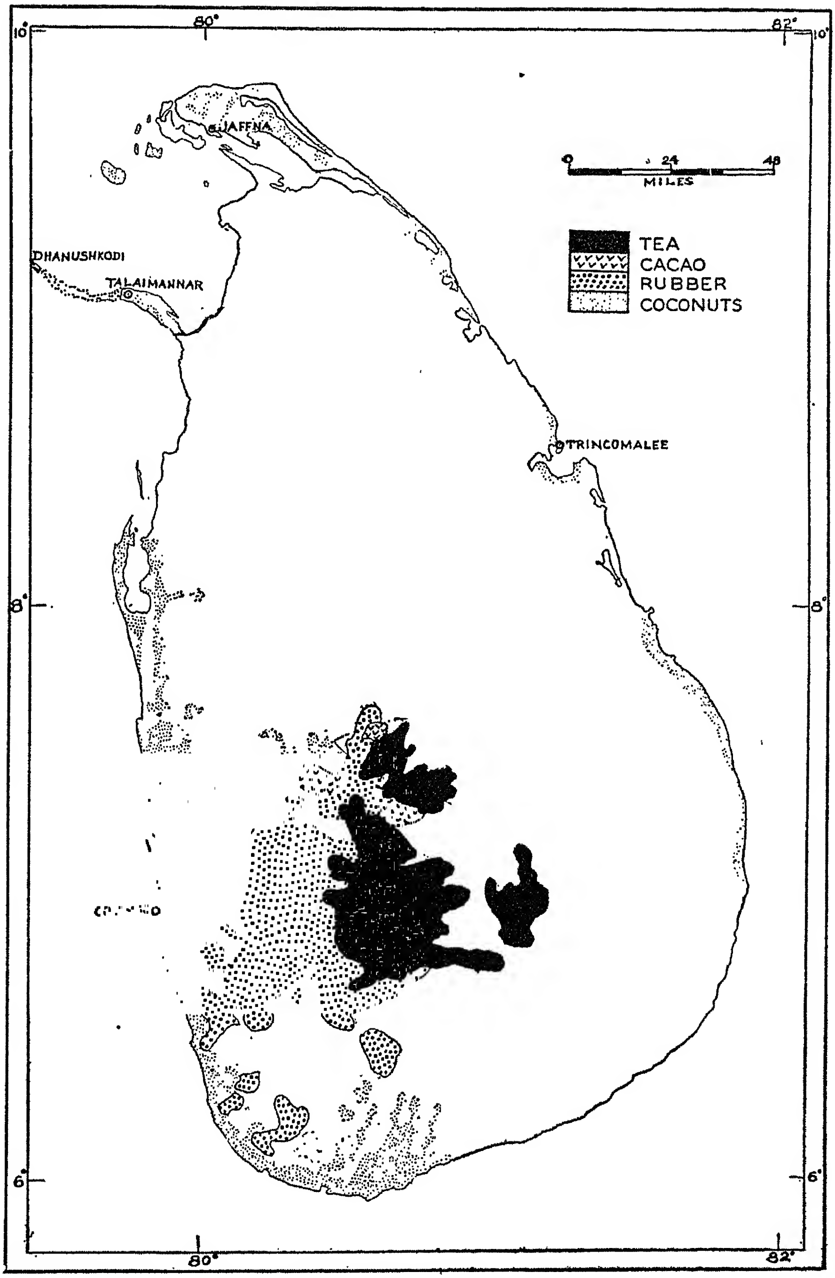

Fig. 95.—Distribution of leading commercial crops in Ceylon.

economy. More than 12,000,000 bushels are produced in Ceylon as a whole. This production, however, satisfies less than half of the island's needs; and imports, chiefly from Burma, are therefore depended upon to make up the deficiency. In fact, rice is normally the leading item among Ceylon's imports. In the highland region the rice acreage is surpassed only by that of tea and rubber, and even on steep slopes much terraced land is given to paddy rice. Yet the crop covers a larger area in those parts of Ceylon located below the 1,000-foot contour.

Cacao (Theobroma cacao) was originally introduced into Ceylon from South America by the Dutch. It is a distinctive crop of the highland region, especially in the districts north and northeast of Kandy.

Mineral products.—Many varieties of precious and semiprecious stones are found in the old rocks of the highland region. These stones include sapphire, ruby, topaz, spinel, zircon, and moonstone. Graphite, however, is the most important mineral export of Ceylon. During the World War production reached a high peak, but more recently the discovery of large surface deposits of graphite have been made elsewhere, especially in Madagascar, and the Ceylon industry has suffered, as reflected in the great number of graphite mines that have been closed.

The maritime region.—Surrounding the highlands and stretching to the adjacent waters in all but the northern part is the maritime region. Its geographical base consists of areas of laterite covering the old hard rock of the island and strips of alluvium deposited by the numerous streams, many of which have their sources in the rugged central mountain core. Along the coasts the land is flattish or undulating, and the coast line is quite irregular, many indentations being formed by the brackish lagoons and lines of sand dunes. The climate of this region, although tropical in general, varies from place to place. The western and southwestern lowlands, located in the path of the southwestern monsoon, have the largest rainfall, whereas the southeastern districts, which

miss the direct influence of both monsoons, are normally relatively dry (Fig. 96). The eastern and northeastern lowlands, however, are located under the influence of the northeast monsoon and have a moderately abundant rainfall, most of which is received during the winter half-year (Fig. 97).

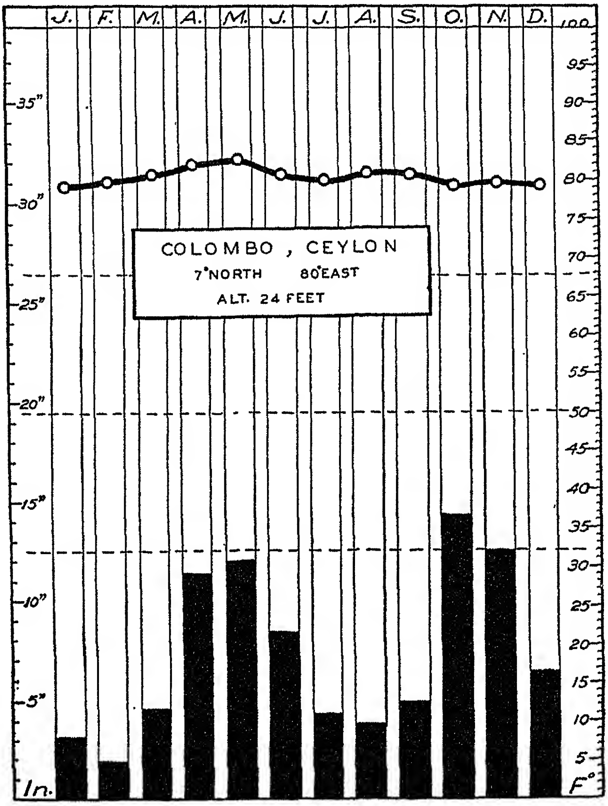

Fig. 96.—Mean monthly temperature and rainfall records of Colombo, Ceylon.

The agricultural industry.—The maritime region, like other parts of Ceylon, is devoted mainly to agriculture, which may be characterized as diverse in character—especially in the higher lands, where the mixed tree cultivation of the Singhalese characterizes the agricultural economy. Although coconut trees and rice fields cover the greater part of the cropped land of this region, a mixed culture is quite common; that is,

a system of agriculture in which a given farmer grows a number of plants, such as mangoes, areca nuts, yams, coconuts, and rice. In some places pepper, cinnamon, and rubber add to the storehouse of agricultural products. From the standpoint of land utilization, however, the three most widely grown plants are coconuts, rice, and rubber.

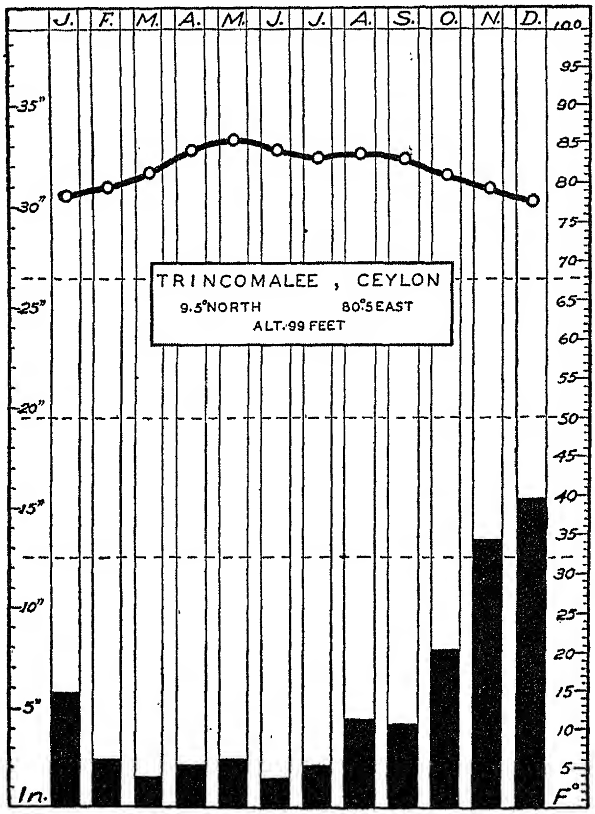

Fig. 97.—Mean monthly temperature and rainfall of Trincomalee, Ceylon.

The coconut industry.—Of the total arable land of Ceylon a larger percentage is given to coconut trees than to any other crop, normally more than 900,000 acres. The greater part of this acreage is found in the maritime region, especially in the southwestern part of the island, where the natives have long used the palm and its various products for food,

drink, clothing, and shelter. Until recently it was thought that the coconut palm would thrive best only in the coastal districts, but it has been found that trees planted in the interior produce nuts as rich as those produced near the seacoast. In this region, as well as in other parts of the island, the coconut industry, unlike tea and rubber, is under the control of the natives.

As a producer of coconuts, Ceylon is less important than India; but as an exporter of coconut products, and therefore as a source of supply in the commercial world, the island ranks fourth largest in the world, whereas India is unimportant. In the export trade of the island, the coconut products are surpassed in value only by tea and rubber.

Other agricultural products of maritime Ceylon.—A study of land utilization of Ceylon discloses the fact that rice, rubber, cinnamon, and citronella grass are other significant plants in the agricultural economy of the maritime region. The rubber plantations extend into the higher lands, where they become continuous with those of the highland region. Areca palms are grown for their nuts, which are dried, cut into shavings, and chewed with betel leaf and lime or tobacco by the natives of Ceylon and India. The greater part of the exportable surplus of these nuts (96 per cent) finds a market in India.

Ceylon is still distinctive in the production of cinnamon, although this commodity no longer holds first rank among the exports as it did during the days when the clipper ships sailed for the Orient in search of cargoes of spices and precious stones. Most of the present area (25,000 acres) of cinnamon trees is found in the maritime region, especially on the sandy soils. Here the cinnamon of commerce consists of quills, chips, and oil taken from the cinnamon tree, which normally attains a height of 20 to 30 feet.[4]

Citronella oil is another significant contribution of Ceylon to the commercial world, since Java and Ceylon are the only

[4] The quills are long, thin canes of dried bark about four feet in length.

two countries producing this commodity in commercial quantities. The oil is obtained from citronella grass (lemon grass), of which there are approximately 33,000 acres, mainly in the southwestern part of the maritime region, where the districts adjacent to Galle and Matara are noteworthy.

The northern lowlands.—In the northern part of Ceylon, limestones constitute the rock base of red and reddish colored soils, in a physical setting where the land rises only some 200 to 300 feet above sea level. In this northern plain there is a relatively small amount of rainfall, and tank irrigation has long been an essential feature in the agricultural system. Here land utilization centers about rice and coconut trees.

The waters adjacent to the northern lowlands contain the celebrated pearl banks of Ceylon, of which the most productive are located on the Gulf of Mannar off the northwest coast of the island. These are under the control of the government, and are worked only when conditions permit.

Manufacturing and commerce.—The manufacturing industry of Ceylon is concerned mainly with the processing and preparing of agricultural products for the market. On the larger plantations factories are engaged in desiccating coconuts, in converting juice from rubber latex into crude rubber, and in processing tea. In coastal areas salt is evaporated from sea water. In still other districts potteries, silver and brass works, and basket and mat weaving add to the island's manufactures. In general the products of the cottage industry are consumed locally; and the island is dependent upon the outside world for the products of the large modern factory, of which cotton piece goods are noteworthy.

Among the imports of the island, the cotton piece goods are surpassed in value only by rice, which comes mainly from Burma. Other imports of importance include coal, petroleum, and sugar. The total imports just about balance the exports, the chief of which are tea, rubber, and coconut products.

As a British Crown Colony, Ceylon trades mainly with the United Kingdom, the latter country taking more than 40 per cent (by value) of all the island's exports. Most of the re-

maining foreign trade is conducted with the United States, British India, and Burma. Next only to the United Kingdom as a market for Ceylon's exports, the United States takes large amounts of the island's rubber and tea. On the other hand, in the bazaar shops of the chief cities of Ceylon may be found a great variety of articles bearing the trade mark "Made in U. S. A." Yet petroleum products and automobiles are among the chief imports from the United States.

The chief ports.—At one time Galle, a city located on the southern end of the island, was the chief port of Ceylon; but after the artificial harbor of Colombo was completed, the latter city rose to its dominant position as the leading foreign trade center.[5] Although excellent natural harbors, such as those at Galle and Trincomalee, are found in Ceylon, these ports either have a poor hinterland or are so situated that they lack proper transportation facilities or adequate population.

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PART IV
SOUTHEASTERN ASIA

CHAPTER XV

Siam and British Malaya

SIAM

Significance of the country's location.—The Kingdom of Siam occupies an intermediate position on the peninsula of Indo-China, being situated between French Indo-China and Burma. Like the latter countries, Siam is located between two large, densely populated regions, the Sino-Japanese area and India. Thus, by reason of its location, Siam benefits from trade with these larger rice-consuming lands. Moreover, its location near the Strait of Malacca, where the great trade route of the Far East follows a restricted channel, places Siam in a favorable location for the development of foreign trade But this trade has not reached very large dimensions as yet, since the purchasing power of the great masses of Siamese is low.

Although surrounded by colonies or protectorates of European powers—Burma on the north and west, French Indo-China on the north and east, and British Malaya to the south—the Kingdom of Siam is the only independent nation in southeastern Asia. With its 200,234 square miles of land, the country compares in area with Germany and France, and possesses natural resources of commercial value.

The population.—According to recent census returns there are approximately 11,500,000 people in Siam. The resulting density of population is therefore almost 50 people per square mile of land. This density, however, is lower than that of China proper or India, especially when compared with the population density of the major river valleys of those countries. It is in large measure because of the lower density of its population that Siam has become an important exporter

of rice, which usually finds a ready market in India, China, and the East Indies.

The greatest density of population is found in the Menam River Valley, particularly about the mouth of the river, where

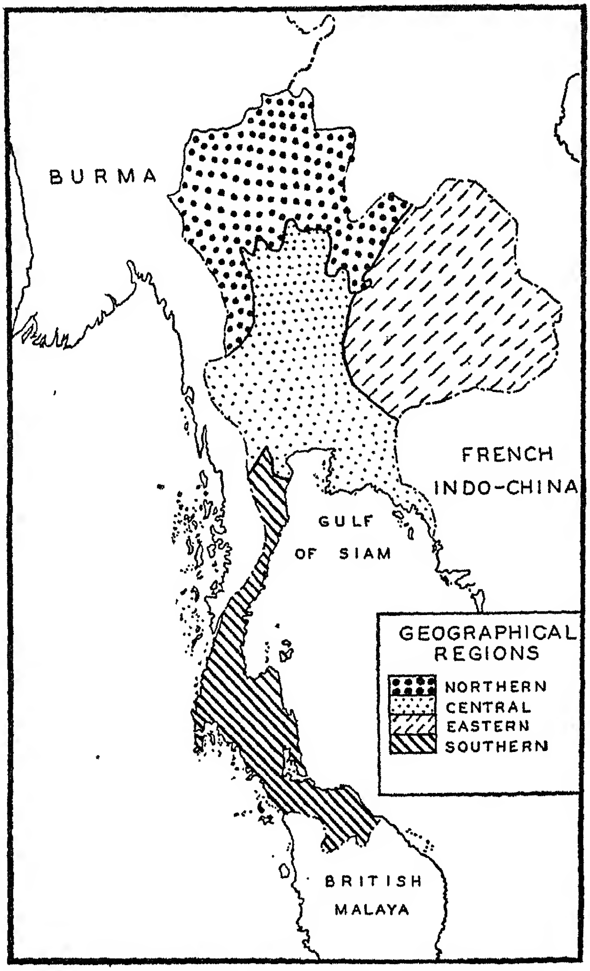

Fig. 98.—The major geographical regions of Siam.

the rich soil composed of recent alluvium makes life easy. This river is to Siam what the Irrawaddy River is to Burma and the Mekong is to French Indo-China.

Of Siam's 11,500,000 people approximately 8,000,000 are

Siamese. These are descendants of the original "Thai" or "Free" people, who gave their country the name, "Nuang Thai," or "Kingdom of the Free." Large parts of northern Siam are inhabited by uncivilized hill and jungle people, who constitute perhaps ten per cent of the total population. In addition, there are approximately 750,000 Chinese in Siam at the present time. They have practically monopolized the retail and wholesale trade of the country—a condition found also in other countries of southeastern Asia. In southern Siam the Malayan inhabitants are found in great numbers. These have been fairly well assimilated, and at the present time speak the Siamese language but retain their own religion. These people are known as Siamese Mohammedans.

Natural regions of Siam.—Siam may be divided into four major natural regions: (1) northern Siam; (2) central Siam; (3) eastern Siam; and (4) southern Siam (Fig. 98). The northern region is a forest-covered mountainous area similar in many respects to the Shan states of Burma. South of this region is found the valley of the Menam, a great alluvial plain which stretches equatorward to the Gulf of Siam. The eastern part of the country drains into the Mekong, the great river of French Indo-China. South of these areas Siam stretches equatorward on the Malay Peninsula to approximately the sixth parallel of latitude.

Northern Siam: teak region.—Covering an area of approximately 60,000 square miles of land, northern Siam is distinctive as a region occupied by Lao tribes, whose small clearings constitute minor features in a natural setting of valleys, highlands, and forests. As in Burma, most of the hills and valleys of northern Siam trend north-south, the highlands increasing in elevation towards the northwest, where some of the peaks attain altitudes of more than 6,000 feet. The slopes of this highland area are clothed in extensive forests. Here the cultural landscape conforms to a natural setting in which a linear pattern is characteristic. The better cultivated lands are found mainly in the valleys, most of

which trend from north to south, and in places extend in the form of a dendritic pattern into the highlands.

Teak, the most important export of northern Siam.—Like the northern highlands of Burma, those of Siam are distinctive as a land of forests in which teak is the most important commercial tree. In northern Siam these forests cover 41,000 square miles (about the size of Ohio), or approximately one-fifth of the total area of the country, and are the most valuable state property of the Kingdom. However, the actual teak-producing sections do not make up more than one-fourth of the forested land in which this tree is found.

Constituting one of the country's most important assets, the teak forests supply much of the timber for local use as well as an annual export valued at from three to five million dollars. The importance of teak in tropical lands is mainly due to the resistance of this tree to decay and attacks of termites. Moreover, the wood is durable and sometimes produces a beautifully figured grain. Teak is especially desirable in construction work where there is contact with iron, since it deteriorates less rapidly from rust than do other woods. Leading shipbuilding nations, therefore, demand a large share of Siam's teak, which was originally worked by various traders—Burmans, Shans, Chinese—through permits obtained from the Lao chiefs; but since the closing decades of the last century European firms have provided the principal markets.

During the rainy season the traveler along various of northern Siam's rivers will see evidences of this important industry, since transport is chiefly by floating. In tracing these logs to their places of origin, one sees elephants at work dragging the cut timber to the nearest streams; and in some places they may be found assisting in relieving congestion in the rivers when the logs become jammed.[1] Green teak logs will not float because they are heavier than water. Thus, before this type of timber is cut it is dried and seasoned by means of cutting a ring around the trunk—penetrating the outer

[1] This operation, commonly known as "ounging," is not only difficult but at times extremely dangerous to men and animals.

bark and bast—a process known as "girdling." Trees are girdled at least two years in advance of felling, the latter activity taking place mainly during the rainy period to avoid damage to the dry bole in falling.[2]

In the streams of northern Siam the logs usually float singly by reason of the number of rapids found in this region of steep gradients. Farther southward the rapids give way to more quiet waters, where the logs are sorted into rafts of about 200 each and then allowed to float to their destination. But the period of rains may come to a close long before the rafts have reached the sawmills, and the stranded logs must await the high waters of the following year before they can continue on their journey. In fact, this process may be extended through five years before a teak log reaches Bangkok from the district where it was cut.[3]

But teak timber is sent also in other directions. Some of it—approximately 12 per cent—goes down the Mekong River into French Indo-China and the Salween River into Burma. It is from the northeastern part of Siam that the teak finds an outlet through French Indo-China, reaching the port of Saigon; and from western Siam many of the logs are floated on the Salween River to Moulmein, Burma. The rest float from various tributaries of the Chao Phya River, down that river to Paknampo, a forest duty station located 155 miles north of Bangkok, where the cubic contents of the logs are determined and where the government royalties are collected. These royalties amount to as much as $1.73 for a large log and $0.42 for a small one. Here logs are sorted, the low-grade timber remaining for local sale while the others are floated in rafts to areas conveniently located with respect to Bangkok, where they are held until required by the sawmills of that city.[4]

Although floats are the chief means of getting the teak logs to the sawmills, other methods are used. Sometimes logs

[2] Pugh, M. A.: "Economic Development of Siam," *Trade Information Bulletin*, No. 606, Dept. of Commerce, Washington, D. C., p. 17.
[3] *Ibid.*
[4] Bliss, D. C.: "Industrial Machinery Market in Siam," *Trade Information Bulletin*, No. 738, Dept. of Commerce, Washington, D. C., p. 4.

are carried to the larger streams on buffalo or bullock carts, especially during the hot months, when elephants can not work effectively. About a dozen animals are required to pull one of these carts. In addition, mechanical transportation is becoming increasingly important. Several tramway logging lines have been constructed, one being 50 miles in length.[5] Chutes are also used in transporting the logs short distances, especially in districts where the slopes have a steep gradient, whereas in other areas tractors and trucks are employed to a limited extent for hauling.

Other timber.—Within northern Siam a number of trees other than teak appear in the natural forest landscape. In some districts, for example, one may see the payung, a rosewood of commerce, which finds a market mainly in China, where it is used for the manufacture of hand carved furniture. Most trees other than teak, however, are too heavy for floating; and by reason of the fact that land transport is expensive, such trees are but little exploited for the export trade.

Cultural landscape.—Agriculture, however, is the foremost economic pursuit. It is the most widely practiced, the chief source of wealth, and it dominates the cultural landscape of northern Siam, teak exploitation being a commercial enterprise which has much less bearing upon the lives of the masses. In general the cultural pattern is found in a natural setting in which valleys and slopes covered with forests predominate. In the stream and river valley flats, irrigated paddy rice occupies a conspicuous place. It constitutes an extension of cultivation from the plain of central Siam in the form of dendritic patterns into the highland region. Terracing is moderately well developed not only in the foothills of highlands, but also on many of the alluvial deposits at still lower elevations. In general rice culture follows relatively primitive methods. The land to be used for rice is hoed and planted to that crop before the coming of the monsoon rains. It is commonly given to rice the following year and may yield

[5] This line is located in the Lampang forest division.

still another yearly output; and in the non-terraced districts the mechanical weathering and erosion characteristic of slope lands in the tropics cause an abandonment of the land, which reverts to forests. New forested areas are therefore cleared, usually during the dry period which precedes the summer monsoon.

In this part of Siam there is a noticeable change in crops at different levels by reason of the fact that the temperatures become lower with increased elevation. Thus at the lowest levels are grown paddy rice and cotton, the latter mainly in well drained areas, whereas at higher levels tea and tobacco become relatively important. Still higher, middle latitude crops, such as buckwheat, maize, peas, and beans, may be found. In general no rice is grown above the 5,000-foot contour.

The inhabitants of this part of Siam live in villages, where the cultural pattern reflects steep-roofed straw and bamboo huts surrounded by small garden plots in which fruits and vegetables are grown for home use. Here the average rice farmer owns approximately two acres of land which extends beyond the village. In addition, his farm equipment consists of a pair of water buffaloes, one or two bullocks, a cart, and a few necessary tools. It has been estimated that the total value of the land, house, livestock, cart, and implements belonging to the average rice farmer of this part of Siam amounts to only 750 bahts ($330). He appears to have relatively little surplus for spending on non-essentials, and his buying power is distinctly low. Yet foreign goods are purchased occasionally and are handled mainly through Chiengmai, the chief center of this region.[6]

Central Siam: major rice region.—As the most important and most densely populated of the various geographical regions of the country, central Siam comprises the lower and middle parts of the Menam Valley and contains approximately 55,000 square miles of land. It is essentially an alluvial plain

[6] *Commerce Reports* (June 1, 1931), Dept. of Commerce, Washington, D. C., p. 514.

with few hills. Here extensive areas of alluvial soils constitute the most important agricultural lands of Siam. Some of these lands are frequently enriched by floods carrying silt, which is deposited mainly in the lower part of the Menam Valley.

Climate.—The climate of this region differs but little from that of upper Siam. Both regions get their rainfall with the summer monsoon, but upper Siam receives the greater amount. The average annual rainfall of central Siam is approximately 60 inches, and for the rainy season (June to November) 48 inches; whereas the more elevated lands of northern Siam receive from 60 to 80 inches of rain per annum. The temperatures are high throughout the year, with an average above 70°F.

Rice production.—Soil and climate combine to make the region an important producer of agricultural crops. Alluvial soils, high temperatures, and a monsoonal rainfall all favor the production of rice, a crop which covers more than 90 per cent of the cultivated land. But the water needed for rice is approximately 72 inches, whereas only 60 inches of rain falls per annum. Irrigation is therefore necessary, especially when the rains are deficient and the rivers fail to inundate the land. At first a system of locks, sluices, and canals was used to conserve the water, but these were unable to insure a supply during dry years. The government, therefore, engaged trained engineers, and by 1916 several modern projects were inaugurated, one of which (the Pasak Southern Canal System) is of great importance to central Siam. Irrigation water from the Pasak River, a tributary of the Menam, is supplied to a large area in central Siam by means of a main canal, branch canals, and distributaries.[7] This great irrigation system is now of inestimable value to the country.

Looked upon as the very life-blood of the nation, rice is Siam's chief source of wealth; and the major area of production is the Menam Valley. Here a major objective consists of getting more and better rice, and the importance of the crop is

[7] Pugh, M. A.: "Economic Development of Siam," *Trade Information Bulletin,* No. 606, Washington, D. C., 1929, p. 13.

reflected in the fact that even significant social events center about its growth. Thus, from time immemorial one of the chief festivals of Siam has been the plowing ceremony, which is performed early in May, when a special field is set aside for it in Bangkok. At this ceremony, rice, plow, and bullocks are blessed by Buddhist and Brahman priests, the strip of soil to be plowed receiving flowers, charms, and sacred water.

Rice is Siam's chief contribution to international trade. It is the leading item of export and Siam is normally surpassed only by Burma and French Indo-China, among principal rice exporting countries. From Siam this commodity finds its way to foreign markets, mainly through Bangkok, the country's leading port and commercial center.

Communication on the Menam.—In the valley of the Menam the Siamese not only use the river as a major means of transportation, but many of them pass a large part of their lives on the water. On the Menam may be seen great numbers of boats, many of them propelled by women and children. A boat appears to be a necessary part of every person's household equipment.

Eastern Siam.—This region is a vast basin area with an elevation of about 600 feet above sea level. It drains eastward into the Mekong River, but the drainage in many parts of this shallow basin is imperfect and waterlogged soils are common. Surrounding the region is a rim of highlands which intercept the rain-bearing winds, giving the greater part of the basin a lower rainfall than the valley of the Menam.

Until recent years eastern Siam has been rather effectively cut off from the other parts of the country. At the present time a railroad line gives this region contact with Bangkok, but many parts still suffer from poor transportation facilities. Various rivers which flow into the Mekong provide some local transportation, especially for the dug-out canoe, but in places contain pestilential tracts during the rainy season, whereas during the dry season these streams are much impeded by shallows, rapids, tree trunks, and other obstacles.

The environmental handicaps outweigh the opportunities in

eastern Siam, as reflected in the sparse population. Among the major regions of the country it is of minor importance. It is a backward region in which most of the inhabitants are engaged in subsistence agriculture.

Southern Siam: tin and rubber region.—Southwest of Bangkok, Siam projects into the long narrow neck of the Malay Peninsula, where it separates southern Burma from the Malay States and occupies the whole of the central part of the peninsula. Geographically distinct from the rest of Siam, this region is located closer to Penang and Singapore than to Bangkok, and most of the foreign trade of the area is conducted independently of Bangkok. As an economic-geographic unit this peninsula area is, therefore, more closely connected with the Federated Malay States than with Siam, a large part of the population of the region being Malayan. Here rubber and tin are the leading items of commercial production. This is mainly a hard-rock area. The southern latitudinal location of this region is reflected in a more uniform temperature and precipitation than one may find in the regions to the north. In large parts of the region the granites of the axial ranges have been folded and faulted. Thus the sandstone, shales, and limestones along their flanks have formed a rugged topography, where cultivation, especially of rice, is confined chiefly to the valleys and plains. There also the greater population densities may be found.

Rubber production.—As in other parts of Siam, rice is the major crop also in the southern region, but rubber is the distinctive crop. Unlike the regions farther north, this part of the country has no well-defined dry season, and rubber can be grown successfully as far north as Bandon (9° N. latitude). Most of the rubber plantations, however, are small and Chinese owned. Here cheap labor is available, the local supply being easily supplemented by imported Chinese and Tamils.

The tin-mining industry.—Of Siam's mineral products the principal one is tin, which is mined extensively in the southern region, where the tin fields represent an extension of those in northern Malaya and resemble them in many respects. Here

the ore is found mainly in alluvial deposits and placer mining rather than lode mining is practiced. In tin mining, primitive and modern methods are found side by side. The activities of the Chinese tin miners, who generally follow primitive methods, are believed to date back at least 200 years. On the other hand, large tin dredges are operated by European and Australian firms.

Manufacturing and commerce.—Like the Asiatic countries thus far studied, Siam is predominantly agricultural, a producer of raw materials, and practically undeveloped as a manufacturing country. In general, the only outstanding industries of Siam are rice milling, tin mining, teak lumbering, and sawmilling.

The paddy grown on the Siamese farms must be milled and cleaned of its outer husks before it is suitable for consumption, and one of the most widely used utensils in the rural districts of Siam is the crude mortar and pestle with which the housewife pounds out the daily portion of rice. For the export trade, however, rice is milled by machinery, the process being the most important machine industry in Siam. Formerly all milling was done in Bangkok, where the rice was transported by water; and even at the present time it is an important rice-milling center, but a tendency toward decentralization is evident. Small rice mills have been established in many parts of interior Siam, and it is estimated that approximately 600 mills have been erected outside of Bangkok.[8]

Commercial development.—Although Siam's foreign trade normally shows a favorable balance, the total value of exports and imports seldom reaches $200,000,000 annually; and the per capita trade is greatly exceeded by that of British Malaya. In this trade three items—rice, tin, and teak wood—surpass all others among the exports; whereas cotton piece goods, machinery, gunny bags, petroleum products, and motor cars constitute the leading items purchased from the outside world. The foreign trade is conducted mainly with Great Britain and

[8] Bliss, D. C.: "Industrial Machinery in Siam," *Trade Information Bulletin*, No. 738, Washington, D. C., 1930, p. 3.

its colonies—especially India, Malaya, and Hong Kong—Japan, the Netherlands East Indies, Germany, and the United States.[9]

Trade centers.—The only large city in Siam is Bangkok (population 600,000). Strategically located on the banks of Siam's chief river, near its outlet in the Gulf of Siam, Bangkok handles approximately 85 per cent of the country's foreign trade. It is the chief outlet for Siam's rice and teak.

In the interior of the country the trade centers serve their tributary areas and are chiefly of local importance. These centers, as well as the ports of Siamese Malaya, are small and of minor importance as compared with Bangkok. In northern Siam, Chiengmai is the most important trade center and is reached by rail from Bangkok, whereas in eastern Siam, Korat serves as a commercial center. In the southern part of the country sea-born trade is handled through a few small ports on both coasts, of which Puket, the chief Siamese tin center located on the island of the same name, is the largest. Although it is far surpassed by Bangkok in foreign trade, Puket is the second port in Siam.

BRITISH MALAYA

Importance.—Located at the southern end of the Malay Peninsula is a group of British possessions comprising the Straits Settlements, the Federated Malay States, and the Non-Federated Malay States. With a combined area of 52,600 square miles, these units have a total population of 4,351,000 (1931). Here the British have some of their most valuable holdings, mainly by reason of the fact that this Malayan region contains rich reserves of tin, a vast acreage of rubber, and the very significant strategic base—Singapore, "Crossroads of the East."

The physical setting.—Separated from Sumatra by the Straits of Malacca, British Malaya comprises a mountainous peninsular region in which a central granitic watershed causes

[9] *Commerce Yearbook,* Vol. II, Washington, D. C., 1932, pp. 582-588.

rivers to flow to the east, south, and west coasts (Fig. 99). This interior highland divide reaches altitudes of 4,000 to 8,000 feet and breaks down quite sharply on the western side to mountain foothills, elongated ridges, and rolling country at elevations of approximately 1,200 feet above sea level. Below these foothill districts the rolling land gives way to areas of gently undulating relief and finally to flat coastal plains, which

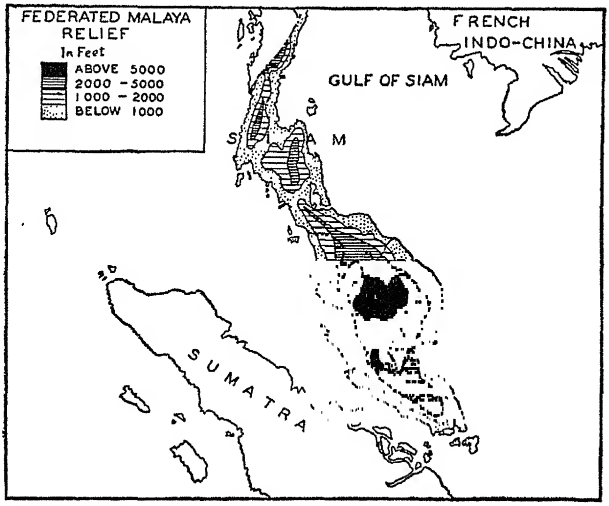

Fig. 99.—Relief of the Federated Malay States. (Altitudes according to J. Paul Goode.)

vary in width from one to thirty miles. These plains together with the adjacent foothills constitute the most imporant rubber-producing lands of Malaya. In the plains the soils consist mainly of fine silt loams and clays, whereas the foothills contain sandy loams and in some districts heavy clays. The chief rubber-producing districts tend to gravitate towards the regions of gently undulating and rolling relief, since the low alluvial flats are frequently handicapped by high water table and poor drainage. The alluvial areas, however, constitute Malaya's chief tin producing units, although tin is found also in lode deposits in the flanks of the central granitic ranges of the country. It is from the latter areas that the tin has been

washed into the valleys of the lowlands, where it is worked as placer deposits.

The climate of the Malayan area is controlled by a number of factors, chief of which are: (1) nearness to the equator; (2) the adjacent tropical waters; and (3) location with respect

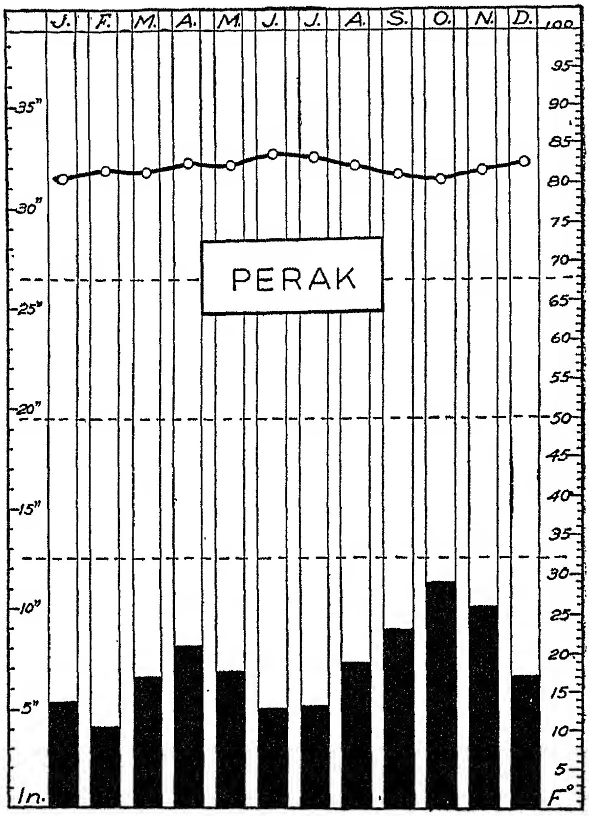

Fig. 100.—A climatic station of Malaya. Note the striking uniformity of temperature and rainfall throughout the year in this tropical rain forest region.

to the monsoonal air currents of Asia. By reason of its location near the Equator, Malaya receives nearly vertical rays of the sun throughout the year, and therefore the temperature range from month to month and from season to season is decidedly small (Fig. 100). In addition, the adjacent tropical seas have a moderating effect upon the land and constitute the

important source of moisture. Both the southwest and northeast monsoons are important factors in the climate of Malaya. The northeast monsoon is the stronger, since it sweeps unobstructed across the China Sea, whereas the southwest monsoonal winds strike the island of Sumatra before they impinge upon the southern and western coasts of Malaya. This climatic advantage of western and southwestern Malaya is reflected in the significant economic developments in these areas. Rainfall is associated with both monsoons, also with convection in this true equatorial region. The rainfall is not only abundant, but it is also well distributed throughout the year, with no pronounced dry season such as is characteristic of most monsoonal lands (Fig. 100). The fact that the rainfall regime is not characterized by extremes—that is, exceptionally abundant rainfall at one season with drought at another—is a significant factor with respect to the rubber industry of this region. Extremely dry seasons would cause leaf fall, and periods of superabundant rainfall would cause leaf disease.

Native vegetation and forest exploitation.—A large part of this region is covered with dense forests, although swamps and marshes fringe some of the lower peripheral parts of the peninsula. The forests of Malaya, like other tropical rain forests, contain a great variety of species, and more than 2,500 known varieties of trees have been classified as indigenous to the Malayan States. Some of the leading foresters of this region believe that even this large number represents no more than 75 per cent of the existing varieties. Related to the forests of the Philippines and the Netherlands East Indies, the forests of British Malaya belong chiefly (more than 60 per cent) to the Dipterocarpaceae family, but the teak, so characteristic among the commercial trees of the former areas, is not widely distributed in Malaya.[10]

In spite of the fact that this region contains a large number of forest species, the commercially important trees are few in number, being scattered and often inaccessible. It has been

[10] "Forest Resources and Lumber Industry of British Malaya," *Commerce Reports* (Jan. 6, 1930), Washington, D. C., pp. 34, 35.

estimated that mixed hardwood forests of the humid continental regions of middle latitudes contain more commercial timber per acre than the Malayan forests.

The importance of the lumbering activity in this region is disclosed by the fact that the Federated Malay States and the Straits Settlements consume approximately 55,000,000 cubic feet of lumber annually. Since that amount is 5,000,000 cubic feet more than the Malayan forests are producing, the annual shortage is met through the channels of foreign trade, the chief source of supply being Sumatra. But the clearing of new lands for plantations and the rapidly growing local industries will in the course of time tax the forests of Sumatra to the limit, and the Malayan forests will not be sufficient to supply her own future timber needs unless conservation is practiced.[11]

Agriculture.—The areas of concentrated agricultural production are confined mainly to the coastal districts and to some of the interior valleys. Two major agricultural systems may be recognized: (1) the small scale enterprise of the natives; and (2) the plantation system operated by European and Chinese owners. The native population is made up mainly of the Malays. These people do not take kindly to plantation work and are found in great numbers in the lowlands of the peninsula, especially in the western plains, where they cultivate their small patches of rice and other tropical crops. Farther inland one may find small numbers of Sakais, whose culture is generally lower than that of the Malays. In fact, they are physically and culturally but little above the Negritos of the Philippines. As nomadic tree dwellers, their chief occupation consists of the exploitation of animal life, although they sometimes cultivate small clearings in the tropical forests and move to other districts when the native animal life becomes exhausted.

The rubber industry.—As part of the tropical Orient, which produces more than 90 per cent of the world's rubber, British Malaya is the major source of supply, with approximately 42 per cent of the world's rubber acreage and 45 per cent of the

[11] *Ibid.*

total production. In this southeastern part of Asia the rubber industry is relatively young; in fact, it is a product of the present century, since Brazil was originally the chief source of supply for the commercial world. But the Brazilian product was wild rubber obtained under unfavorable conditions in the great Amazon Basin, where the rubber trees are scattered among a great number of other species and where the rainy season (November to May) is a period of high water and extensive areas of inundated land. Rubber collectors penetrated so far into the Amazon region that their journey from Para to some of the districts required approximately three weeks. In addition, this sparsely populated region lacked the necessary labor supply. In short, the handicaps outweighed the advantages in this region, and the cost of producing wild rubber was high. The production was also too small to meet the rapidly growing needs of the automobile industry. Thus, the first decade of the present century witnessed the decline of wild Brazilian rubber and the rise of the plantation product in the Orient.[12]

The geographical environment of southeastern Asia favored the development of plantation rubber. At first a product of experimentation and growth only on the cultivated lands of the Orient, *Hevea braziliensis* entered competition with other crops for the use of the land. But another step forward in this industry was taken when large areas of tropical forest were cleared and utilized for the production of plantation rubber. On the plantations the trees could be cultivated and tended scientifically, and the labor of gathering the latex reduced materially.[13] In addition, the cheap and abundant labor of the Orient together with the advantages in shipping facilities (a region of peninsulas and islands) favored the development of the industry in this part of Asia.[14]

Here British Malaya is the chief producer, with the best

[12] Hotchkiss, H. S.: "The Evolution of the World Rubber Situation," *Harvard Business Review* (January, 1924), pp. 129-138.

[13] However, not all the rubber produced in this region is plantation rubber.

[14] See "British Colonial Office Reports on the Rubber Situation," *Trade Information Bulletin*, No. 603, Washington, D. C.; and Akers, C. E.: *Rubber Industry in Brazil and the Orient*, Methuen and Co., London, 1914.

rubber areas located on undulating to rolling topography. Although much of the original planting of trees took place on the low coastal flats, the poor drainage conditions in many of these districts proved to be a handicap. The climate of the Malayan region is considered almost ideal for rubber trees. The temperatures are uniform and comparatively high and the rainfall is ideally distributed throughout the year, with neither long droughts nor long wet seasons. It has been found that an average annual rainfall of seventy inches is sufficient, provided it is quite evenly distributed throughout the year and provided the soil and subsoil are of such a character as to retain moisture during the drier season. In some districts of the Orient, such as the Malabar coast of India and the Tenasserim coast of Burma, the rainfall of the summer season is so abundant that bark and leaf diseases become prevalent. In this respect the Malayan region has a marked advantage.

The labor situation on the rubber plantations is satisfied mainly by the Chinese, the Tamils, and the Javanese. At present the Chinese are more numerous than the native Malays. As laborers on the plantations, they are taught to become excellent tappers, although they also become merchants, handicraftsmen, servants, and mine workers in British Malaya. In the western parts of the peninsula, Tamil coolies from British India are employed on the rubber estates, where they are considered as a satisfactory type of labor. The Javanese and Hindus add to the stock of local labor. Although it is often difficult to persuade Javanese to leave their island home, the ones who come to British Malaya sometimes remain as permanent settlers after serving their first period of indenture on the plantations.

The tin industry.—In the production of tin the Malay States hold first rank, with approximately 28 per cent of the world's total in 1933. In this region the tin is found as (1) primary and (2) detrital deposits. The former occur mainly in the granites of the peninsula, although tin-bearing deposits are found also in sedimentary rocks. The detrital deposits occur in terraces and in new (recent) alluvium, which constitutes

the most important source. The primary sources yield tin in the form of lode deposits and in the residual soil that develops in this type of parent material. The residual deposits are won in much the same way as placers, the heavier tin being washed free by the process of sluicing. But the greater amount of tin is obtained from the detrital deposits, especially the recent alluvial materials found in the numerous valleys of the peninsula.[15]

The geographical environment of Malaya favors tin-mining: (1) Comparatively rich ore is mined relatively near the surface; (2) labor is cheap; (3) water for sluicing and other processes is plentiful; (4) transportation costs by water as well as rail are low; and (5) the climate, with its year-round high temperatures, necessitates no seasonal shutdowns.[16]

The mining methods vary from place to place, reflecting ancient as well as modern practices. The so-called open-cast system with hand labor is seen in a large number of Chinese-owned mines, whereas some of the largest mines still maintain the old open-cast system with trucks and rails. The "gravel pumping" and hydraulic systems are still other methods employed in winning tin ore. Many of the large bucket dredges operate on hydro-electric power. The ore obtained by shafting in lodes as well as alluvial ground amounts to less than 6 per cent, with the remaining production of tin (94 per cent) secured from surface operations.[17]

The tin is sent in large quantities to the Straits Settlements, especially to Singapore and Penang. Singapore boasts the possession of the largest tin smelter in the world. These smelters obtain ore from the Netherlands East Indies as well as from British Malaya.

Commerce.—The foreign trade of British Malaya shows a moderately good balance, with exports and imports approxi-

[15] For a description of the physical structure of the peninsula see Scrivenor, J. B.: "The Physical Geography of the Southern Part of the Malay Peninsula," *The Geographical Review*, Vol. XI (1921), pp. 351-371.

[16] Bruins, J. H.: "The Future of Tin in British Malaya," *Commerce Reports* (Sept. 23, 1929), Washington, D. C., p. 789.

[17] *Ibid.*, pp. 789 and 790.

mately of equal value. The per capita value of exports as well as imports is generally high, mainly by reason of the marked specialization in economic production—as reflected in the high percentage occupied by para rubber and tin among the total exports (in value) of the peninsula, while copra usually ranks as a poor third.

The imports consist chiefly of rice and manufactures, such as cotton goods, tobacco, and machinery. However, in the interpretation of the imports of British Malaya it is necessary to consider also the large imports of tin ore, rubber, and gasoline into the Straits Settlements.

The United States, the Netherlands East Indies, and the United Kingdom are the major units with which the Malay Peninsula trades. The United States, the chief consumer of rubber in the world, receives a larger percentage of the total exports (42.2 per cent in 1929) than any other nation; whereas the Netherlands East Indies constitute the chief source of the imports, some of which consist of tin ore which moves from the Netherlands East Indies to the Straits Settlements, where it is smelted. Much tobacco and sugar is also found among the imports from the Dutch East Indies. The United Kingdom ranks second to the United States as a market for Malayan goods, and next only to the Netherlands East Indies as a source of the peninsula's imports.

Singapore and Penang are the important trade centers of this region. Both are situated on islands that lie but a short distance from the mainland, and both are significant units of the Straits Settlements. The former is connected with the peninsula by road and railway, and has become one of the great ports of the world in but little more than a century. Selected as an outpost for British traders in the Far East route, the island on which Singapore developed was purchased by Sir Stamford Raffles in 1819 for the East India Company from the Sultan of Johore. At that time it was clothed with a thick vegetative cover, skirted with fringes of mangrove swamps, and occupied by a few savage Malay fishermen. Favorable location with respect to trade routes from the east as well as the

west, where ships are forced to follow a constricted course through the Straits of Malacca, has been a significant factor in its development.[18] With a population of 445,700 (1931) Singapore is one of the busiest trade centers of the Orient. Its cultural landscape also reflects a great variety of races, the Chinese being the most numerous. A part of the city, in fact, is taken up by the Chinese, many of whom live in palatial homes which reflect the economic strength of these people in Singapore. Another part of the city is given to the European quarters, while still other parts are occupied by Tamils, Hindus, Javanese, and the rather indolent Malays.

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[18] For an interesting descriptive article on this island and its development see: Simpich, Frederick: "Singapore, Crossroads of the East," *The National Geographic Magazine*, Vol. XLIX (March, 1926), pp. 235-269.

CHAPTER XVI

French Indo-China

A significant part of peninsular Indo-China.—French Indo-China constitutes the eastern part of the peninsula of which Siam and Burma occupy central and western parts. Stretching from 9° to 23° N. latitude, this country has a climate typical of other tropical wet and dry lands, and climatic diversity is due mainly to variety in relief and position with respect to the seasonal winds. Of the political units of peninsular Indo-China, it has the largest area and population. As in Siam and Burma, so also in French Indo-China, agriculture is the chief source of wealth and the natural setting favors the production of rice, which reaches its most widespread distribution on the alluvial and coastal plains. Of these plains, that of the lower Mekong is the most important.

Protectorates and colonies of French Indo-China.—Politically French Indo-China is made up of the union of five distinctive areas (Fig. 101). In the north lies Tonkin, a nominal protectorate which is flanked along its northern boundary by southeastern China. Annam, a French protectorate, occupies the eastern part of the country and extends westward to Laos, a unit which is in part a protectorate and in part a colony. The southern part of the country is occupied by Cochin China and Cambodia, the former being a colony, the latter a protectorate. The area of the five political divisions of French Indo-China surpasses that of France (Fig. 102).

At the head of the Union of French Indo-China is the Governor General, who is assisted by the grand council of the economic and financial interests and by the Council of Government.

Importance of agriculture.—Agriculture is the chief occupation of the peoples of French Indo-China, although only 10.09 per cent of the total land area is devoted to crops. The

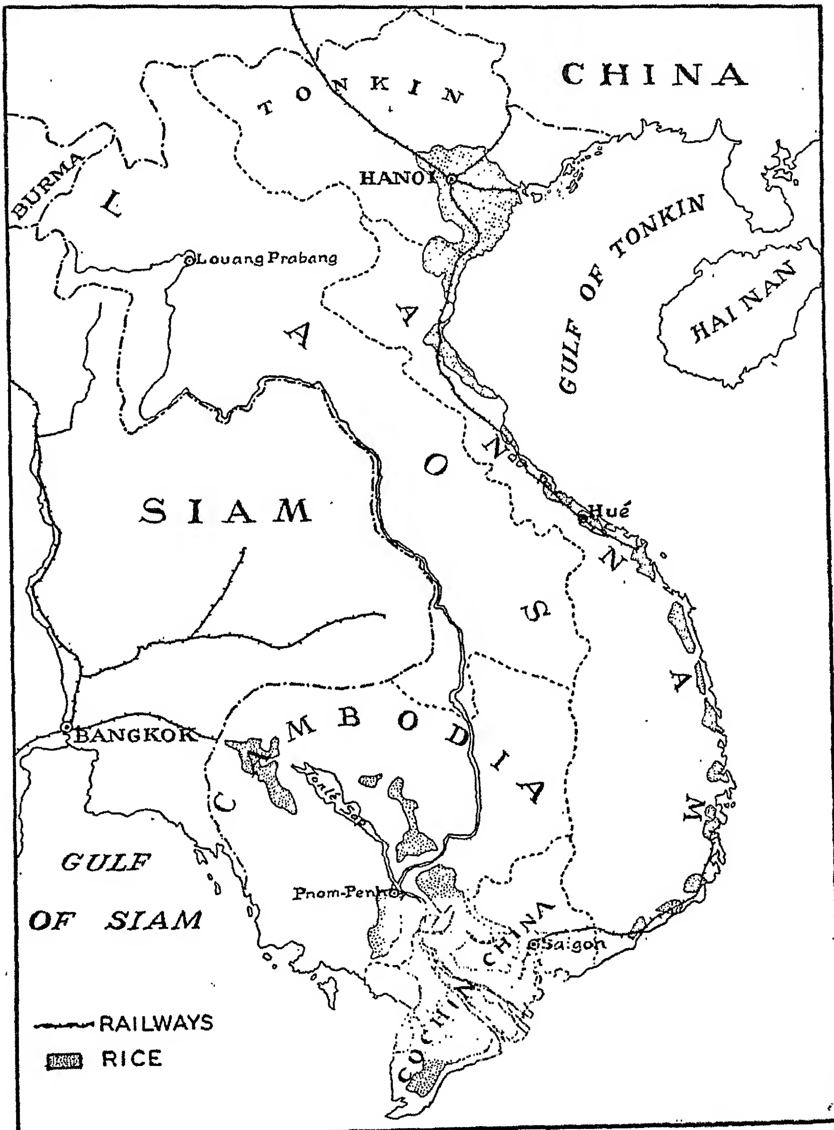

Fig. 101.—Map of French Indo-China, showing political divisions, railways, and chief rice-producing regions.

relatively low percentage of cultivated land is due mainly to the rugged, mountainous character of large parts of the country, especially the political units of Annam and Laos. The population density is therefore approximately 724 per square mile of crop land. As in Siam and Burma, most of this agricultural land is given to rice (12,300,000 acres), and rice alone accounts for approximately three-fifths of the total exports of the country. Other crops of importance are corn, vegetables, rubber, coffee, cane sugar, coconuts, cotton, tobacco, tea, various spices, and nuts.

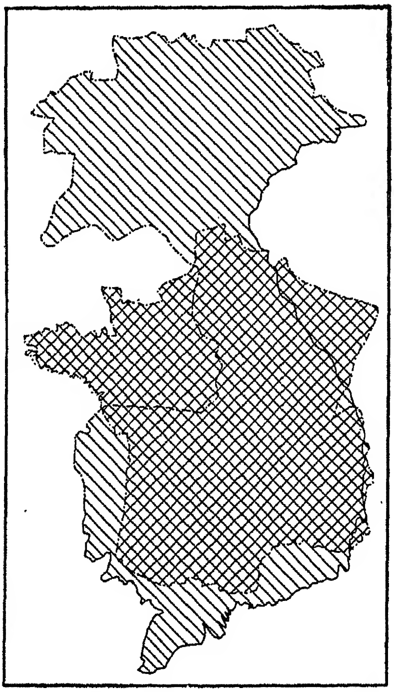

Fig. 102.—France superimposed on French Indo-China. Note the comparative size.

Population.—With a population of 20,600,000 people, French Indo-China has half as many inhabitants as live in France. The average density for the whole country is 73 persons per square mile, which is considerably less than that of France (196) yet surpasses that of most of the French colonies. This density, however, is unevenly distributed within French Indo-China. Thus, some of the remote mountainous districts have less than 10 inhabitants per square mile, whereas the delta region of Tonkin supports a population density of 1,100 on an equal area of land, with some districts reaching densities of more than 2,000. Three-fourths of the population is crowded into the maritime plains, which comprise perhaps one-tenth of the total area of the country. This population of the plains is made up primarily of Annamites (14,-500,000), whereas the Cambodians occupy second rank (2,500,-

000). The remaining population consists of diverse types of Asiatics, Thais, Chinese (350,000), and French (38,000).

A tropical wet and dry climate.—Although all of French Indo-China belongs to one major climatic realm, there is climatic diversity from place to place within the country. Thus the temperatures vary with altitude and latitude, the average

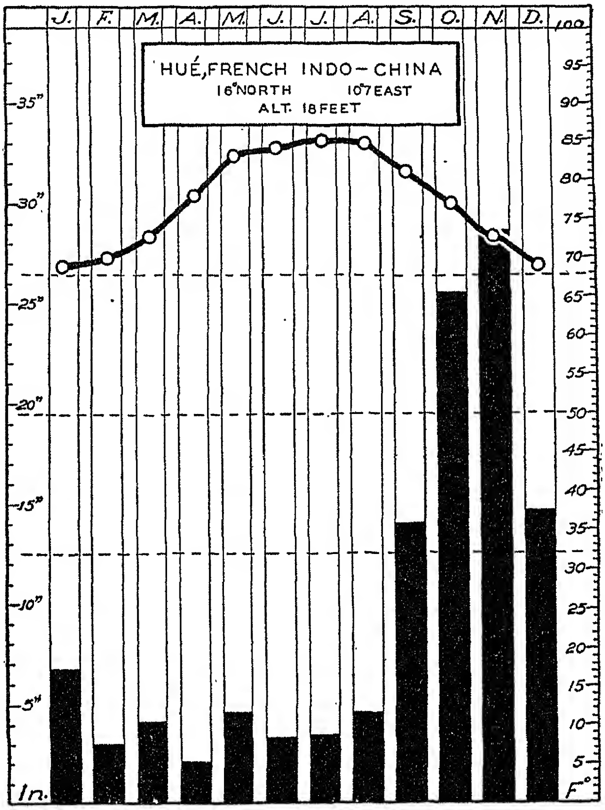

Fig. 103.—Hué is typical of a large part of eastern Annam, which receives its maximum of precipitation during the winter half-year. (Graph based on data obtained from *Annuaire Statistique de L'Indochine*, Hanoi, French Indo-China.)

annual temperatures being lower and the range greater in the highlands of Annam and Laos than in the lowlands of Cambodia and Cochin China. In these lowlands the highest average temperatures are experienced during the spring of the year, the time corresponding to the so-called "hot season" of India,

which constitutes a period of change from the dry winter to the moist summer monsoon. With the "breaking of the monsoon" the temperatures fall because the abundant rains bring moisture to the air, which acts as a blanket in checking extremes of radiation as well as of insolation.

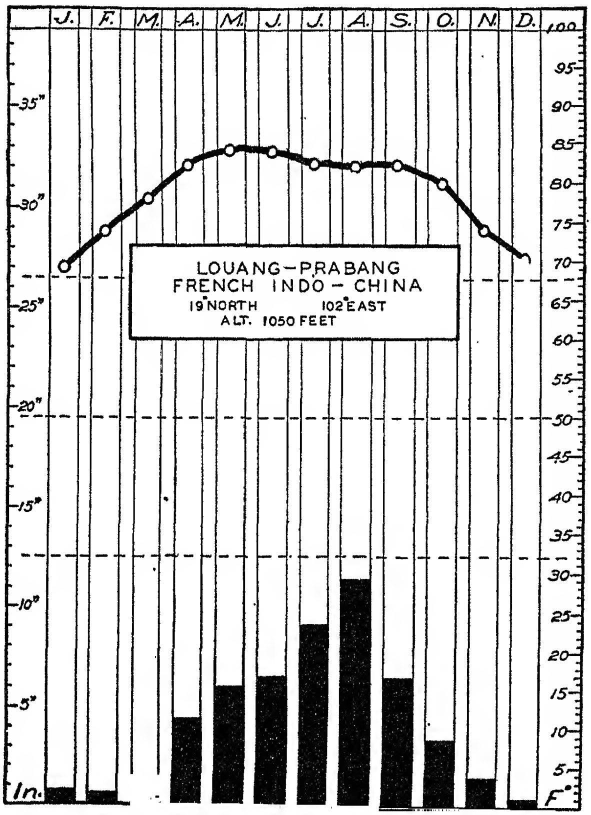

Fig. 104.—The average monthly temperature and rainfall conditions in northwestern French Indo-China. (Graph based on averages for the 17-year period 1912-1929, as given in *Annuaire Statistique de L'Indochine*, Hanoi.)

From the standpoint of man's activities, the seasonal temperature variations are of less significance than the distribution and amount of rainfall. Much of the country is characterized by a distinct summer maximum, as at Saigon, Cochin-China, in the south, and Hanoi, Tonkin, in the north. But the eastern side of Annam, like the eastern Ghats and adjacent

lowland of peninsular India, receives the greater part of its rainfall during the winter half-year, when the currents of air are moving out from the continent; these, being deflected to the right of straight ahead, impinge upon the coast and adjacent slopes of Annam. Since these winds have crossed relatively warm bodies of water to the northeast, they contain an abundance of moisture which is precipitated on the cooler land (Fig. 103). In a large part of this eastern section of Indo-China, November is the time of greatest rainfall, as is indicated at Hué, where, according to the meteorological records from 1907 to 1929, approximately 28 inches of rain constitutes the average amount for this month. Fortunately, the temperatures in this part of the world are sufficiently high, even during the winter half-year, to facilitate agricultural production.

An abundance of rain is also necessary in order that the farmers may obtain a good crop of rice, which is the chief food as well as major item of export. Maximum yields of paddy rice require more than seventy inches of water. Tonkin gets 71 inches and Saigon 78 inches; whereas the climatic records (1907-1929) indicate more than 111 inches a year at Hué, Annam. On the other hand, a large part of northwestern Indo-China has but little more than 50 inches of rain a year, as indicated at Louang Probang, Laos, where 51 inches of rain constitutes the average annual amount (Fig. 104).

Relief and soils.—The relief varies considerably from one part of the country to another (Fig. 105). Some parts are characterized by a tremendous complexity of rock formation, as for example, in Tonkin, where mountains and river plains interlock. Other parts of Indo-China, especially the coastal plains of eastern Annam and the alluvial plains of Tonkin, Cochin-China, and Cambodia, are characterized by simplicity in their surface features. Monotonously level stretches of flood plain with numerous small villages surrounded by intensively cultivated fields of paddy rice dominate the natural and cultural landscape.

In western French Indo-China the low plateau of eastern Siam extends into the province of Laos, the entire plateau re-

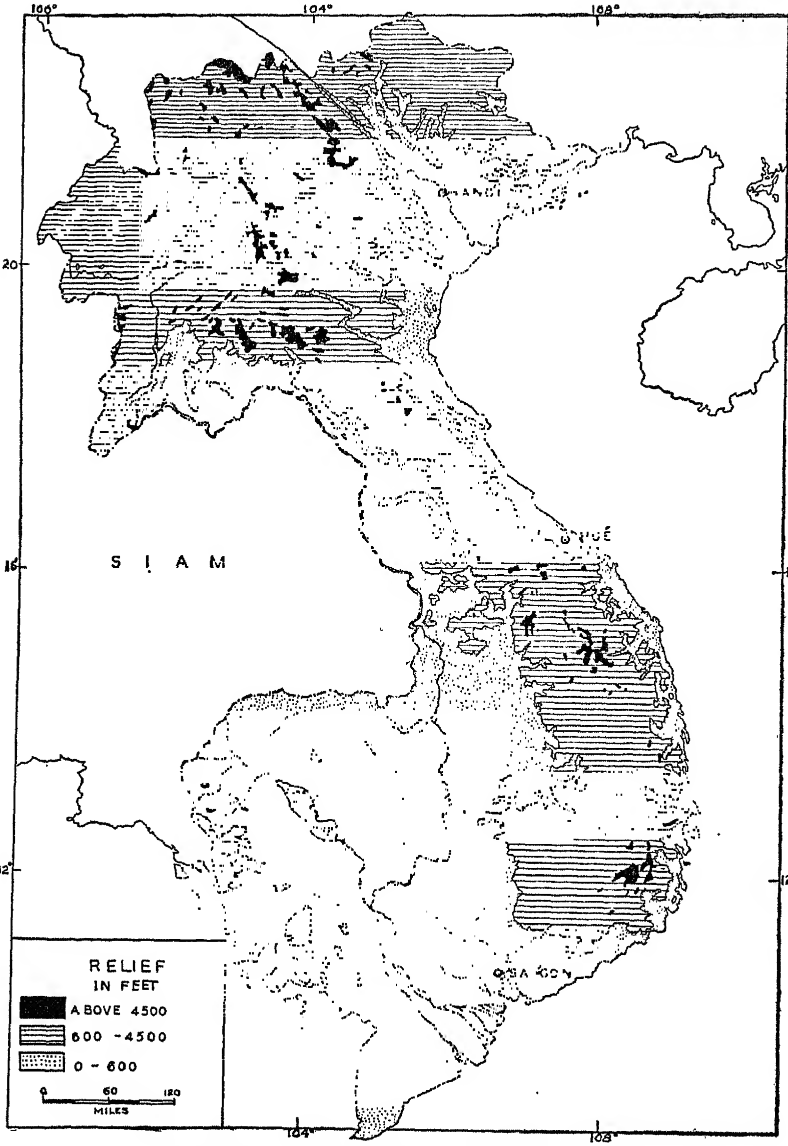

Fig. 105.—The relief of French Indo-China.

gion being drained by the Mekong River, which in the neighborhood of Bassac seeks the lowlands and flows southward through Cambodia and Cochin-China. The Mekong is to

French Indo-China what the Menam is to Siam and the Irrawaddy is to Burma. It is the means of livelihood for the millions of people who live on its alluvial flats. Rising in the distant mountains of Tibet, near the headwaters of the Yangtze, it is the major factor in the actual formation of most of Cambodia and Cochin-China. These political units, in fact, comprise in major part an extensive delta embracing the entire southern section of French Indo-China, which is slowly being enlarged by deposits of rich silt brought down from the highlands of China. Thus in the extreme southern part of the delta the land is encroaching upon the ocean at the rate of 50 to 60 yards per annum.

The plains of French Indo-China fall into two types. First, the interior plains, such as those in middle and lower Laos, which are generally covered with vast stretches of forest and occupied by relatively few people. On the other hand, the coastal plains, especially where rivers and streams deposit their load, constitute the most important geographical units—the most densely populated and highly developed areas in the country.

Cambodia.—As the second largest political division of French Indo-China, the Kingdom of Cambodia covers an area of 67,800 square miles and contains a population of 2,500,000. Consisting largely of plains which continue into Cochin-China, Cambodia is partly a product of the Mekong. This river overflows its banks annually, subsides slowly, and, like the Nile in Egypt, leaves rich alluvial deposits of silt as a fertile seedbed for crops. Among the noteworthy features of the plains is the lake, Tonlé Sap, in which large quantities of fish are caught every year. In the low-lying districts along the lake as well as along the rivers of Cambodia much of the land remains uncultivated.

The cultural landscape of this region possesses a great variety of forms, from extensive flat fields of rice to almost impenetrable forests, with hills in the northern and eastern peripheral areas. In the lowlands the dwellings are composed mainly of straw huts erected on piles. Emerging from the

great sheets of water when the Mekong annually overflows its banks, these dwellings give the plain an expression that is quite distinctive.[1]

Major occupations and economic activities.—The extensive tropical plains of Cambodia suggest the significance of rice production (800,000 tons), whereas large quantities of fish are obtained from the rivers and Lake Tonlé Sap. On the better drained lands much maize (50,000 tons) and cotton are grown, and pepper is produced in larger quantities (3,000 tons) than the mother country (France) is able to consume. Of the livestock, cattle and water buffaloes are raised for domestic use as well as for export, whereas hogs are kept primarily for local consumption.[2]

The food of the Cambodians consists mainly of rice, fish, and legumes. Meat is rarely eaten, except some pork. Their habitations, quite generally erected on piles, are widely distributed and reach their greatest density in the southern part of the region. Farther inland, where the value of the commodities of commerce diminishes by reason of poor transportation facilities, the population density also is considerably lower. Good roads, however, connect Phnom-Penh with Angkor, Battambang, and Saigon as well as with centers located on the Gulf of Siam. In addition, the Lower Mekong and Lake Tonlé Sap are navigable, and provide a channel of water transport from Cochin-China essentially to the interior center of Angkor. In general, however, the transportation facilities in many parts of Cambodia are in urgent need of improvements, and many of the interior districts will develop appreciably only in so far as they are provided with better means of transportation.

Cochin-China.—Comprising the great delta of the Mekong and an area of 25,000 square miles of land, Cochin-China is a colony under the administration of a governor and constitutes

[1] Office Du Gouvernement General de L'Indochine: *Indochine,* Paris, 1930, pp. 17, 18.

[2] Sion, Jules: "Asie des Moussons," *Geographie Universelle,* Vol. IX, Librairie Armand Colin, Paris, 1929, p. 449.

the smallest political unit of French Indo-China (Fig. 106). It is essentially a region of plains, of which the northernmost parts extend to the southern slopes of the highlands of Annam. These plains are very low, and in many areas attain a height of only a few yards above sea level. The recent alluvial ma-

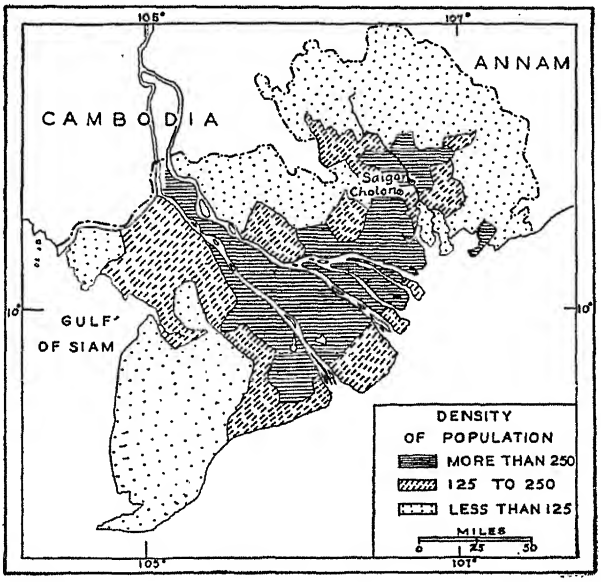

Fig. 106.—Density of population per square mile in Cochin-China. (After Census of French Indo-China and *Geographie Universelle.*)

terials laid down in this area have created an extremely flat surface and a favorable geographical base for rice production.

In Cochin-China the year may be divided into two well-defined divisions—the period of winter, or northeast monsoon, and the period of summer, or southwest monsoon. Winter is the dry season; it is the time of year when the trees lose their vegetation. This season, moreover, may further be divided into two periods: (1) the months November to February, which are cool and salubrious, the most agreeable of the year; and (2) the period of February to April, which constitutes a time of disagreeable heat. The monsoon of summer is the wet season, when the southwest monsoon coming from equatorward areas and passing over warm seas both holds and yields

an abundance of moisture as it moves poleward over these tropical lands. The vegetation responds with full vigor, communication becomes difficult in the lowlands, and the season of major crop production begins. Saigon receives a precipitation of more than 78 inches (2,000 mm) per annum, most of which comes during the summer season (Fig. 107). That

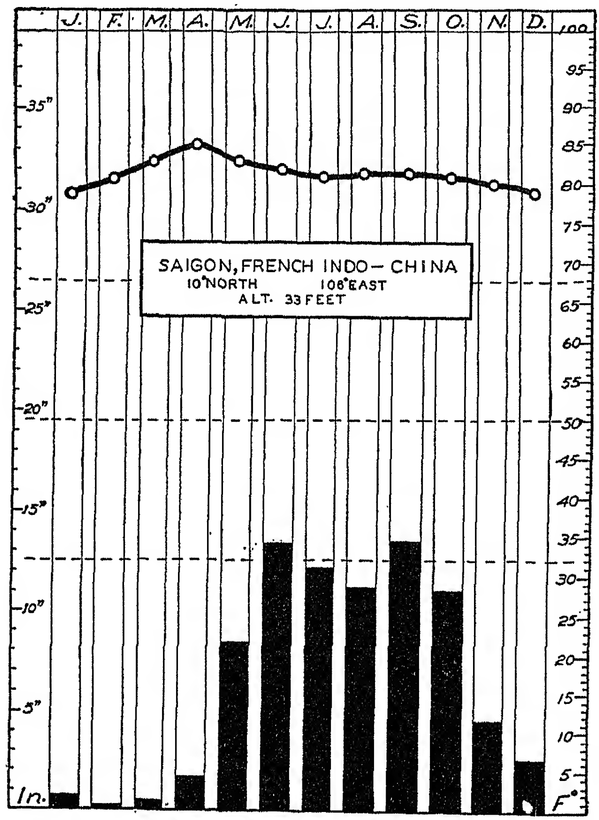

Fig. 107.—Average monthly precipitation and temperature at Saigon, French Indo-China. Note the relatively uniform temperature conditions and the striking seasonal distribution of rainfall. (Graph based on data obtained from a 22-year average record given in *Annuaire Statistique de L'Indochine.*)

amount is sufficient for rice production without the aid of irrigation. But farther eastward the rainfall decreases, as indicated by 30 inches (770 mm) at Phan Thiet.[3]

[3]Although this coastal center is located in Annam, it nevertheless reflects the climatic conditions of extreme northeastern Cochin-China, which is located but a short distance away.

Rice production in Cochin-China.—Natural conditions favor the rice industry of Cochin-China. Level topography, alluvial soils, high temperatures, and an abundance of rainfall during the period of greatest plant growth, are among the primary environmental factors that have made this one of the distinctive rice-producing regions in the Orient. Here the rivers are less dangerous than those of Tonkin (fewer destructive floods). The Mekong is much more regular than the Red River of Tonkin,[4] and generally rises above its banks but once a year, a condition to which the natives have been able to adapt their rice culture. Here neither extensive irrigation nor the building of dikes is required. However, the yields of rice per unit area may be increased. Modern methods of cultivation are not common, and the French have not interfered with the primitive, traditional methods of tillage.

Annam.—The French Protectorate of Annam occupies an area of about 50,000 square miles and has a population of 6,000,000 people, of which only 2,300 are Europeans. As a natural unit this protectorate contains mountain ranges which reach their greatest extent in the western part, whereas to the east, coastal lowlands predominate. These take the form of many small basins separated from one and another by spurs that extend seaward from the highland interior. In certain places the coastal lowlands are sprinkled with lagoons and bays and furrowed with numerous rivers and streams.

Throughout Annam the native tropical vegetation and cultivated crops attest the monsoonal rainfall and temperature regime. Here the year may be divided into three seasons: (1) from September to December, the season of abundant rainfall; (2) December to March, light to moderate rains; and (3) April to September, the dry season (Fig. 103). Thus Annam differs climatically from other parts of French Indo-China in receiving its rainfall during the fall and winter months. This distribution of precipitation is due to the windward location of Annam in the path of the winter monsoon (Fig. 9) and its lee-

[4] The other major rice-producing division of French Indo-China.

ward position with respect to the monsoon of summer (Fig. 10).

Principal occupations in Annam.—The principal agricultural products of Annam are rice and tea. The former is grown intensively in the basins of the narrow littoral, whereas the latter finds a suitable environment on the many moist highland slopes of this region. As the chief foodstuff of the inhabitants, rice is cultivated more intensively than in the richer alluvial areas of Cochin-China and Cambodia. The heavy fall rains enable the farmers to plant rice in the early part of the year (winter season). Other agricultural products include cacao, rubber, spices, and some cotton. There is also a limited amount of stock raising, and the duck is the most plentiful of the birds.[5]

Along the littoral of Annam, fishing is an important and distinctive industry. As in other parts of coastal Indo-China, fish constitute an important part of a diet which would otherwise be quite lacking in nitrogenous substances. In coastal Annam, fish products are consumed in the form of the so-called "nuoc mam," which is to the Annamite what soya sauce is to the Chinese. It is a product that has been described as an auto-digestion of fresh fish and shell fish with sea salt. This is a particularly good characterization in that it conceals more than it reveals.[6]

Within Annam transportation and communication are rendered difficult by reason of the rugged topography, the great number of spurs that extend seaward from the interior highlands.

Tonkin.—Located in the northeastern part of French Indo-China, Tonkin comprises approximately 35,000 square miles of land and contains more people (7,500,000) than any other political unit of the country. It is a land of diversity, and contains a variety of land forms. In the western part of the country (upper Tonkin) highlands predominate. Farther

[5] Gouvernement General De L'Indochine: *L'Indochine Francaise, Exposition Colonials Internationale,* Paris, 1931, pp. 24-28.

[6] *Commerce Reports* (June 6, 1932), Washington, D. C.

eastward (the middle region) these give way to hills, which are located between the rugged mountainous part of upper Tonkin and the delta areas, especially the delta of the Red

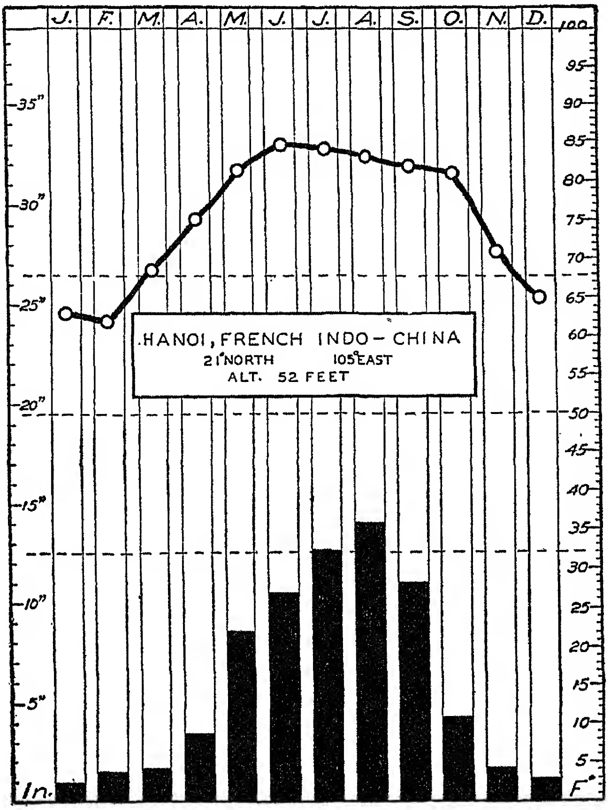

Fig. 108.—Located approximately 21 degrees north of the Equator, Hanoi reflects in its temperature and rainfall distribution the characteristics of low latitude wet and dry regions. (Graph based on data for a 22-year period, 1907-1929.)

River (Fleuve Rouge). The region as a whole, possesses a tropical wet and dry climate (Fig. 108).

In general, the western highlands (upper Tonkin) are quite inaccessible and sparsely populated, and some parts have scarcely been seen except along certain routes of travel. These routes tend to follow the ridges, since many of the valleys are unhealthful, whereas the ridges, especially those above the

3,000-foot contour, have a more salubrious climate, and a temperate zone flora appears here and there. Very little of the good ground has escaped erosion, and the cultural expressions in the landscape of upper Tonkin are found only at intervals on gently sloping and level surfaces. Where cultivation takes place, maize and upland rice are the most important crops. Most of the remaining land is forest and waste, occupied by a sparse population. In fact, all of upper Tonkin has a population density of but 18 persons per square mile of land.

In the middle region, that is, the highlands located between mountainous upper Tonkin and the delta areas, mineral exploitation and the raising of livestock are significant occupations. Here cattle are raised for work in the lower delta regions to the east. Moreover, in some places forest exploitation takes place, and arboriculture prospers on many of the slopes of this area, the products of which include anise, tea, and coffee. Here the French colonists find a more healthful climate than in the lowlands to the east, being actively engaged on plantations and in the management of the rice fields. Indeed, approximately 85 per cent of the concessions accorded the Europeans in Tonkin are found in this highland part of the protectorate. A large part of the land, however, still remains unoccupied; and the population density of this middle region is only 40 inhabitants to the square mile, whereas the neighboring lowlands to the east are overpopulated.[7]

Stretching to the eastward beyond the middle region of Tonkin are the deltas and maritime plains, the most densely populated areas in French Indo-China. Here the deltas occupy ancient gulfs, the borders of which may still be seen, as indicated by marine forms or by notches at the base of the highland spurs which limit the alluvium. The delta of Tonkin with its 5,700 square miles appears from the distance as a monotonous stretch of level land, yet it possesses a relief, the practical importance of which is reflected in its relationship

[7] For an excellent analysis of the Middle Region of Tonkin see Sion, J.: *Geographie Universelle,* Librairie Armand Colin, Paris, 1929, pp. 423, 424.

to the grouping of the inhabitants. Thus the natives living in the relatively elevated districts of the delta seek the sides of the ponds and of arroyos; in the regions of still lower relief they gravitate toward the hillocks; whereas on the ancient beaches and on the levee lands the habitations tend to follow a linear pattern. Seldom does one find isolated habitations, since the struggle against the caprices of the rivers as well as the feeling of security has favored the formation of villages, which are quite commonly found behind artificial levees. The land surrounding the villages is divided by earth embankments which serve as roads. In places this monotonous cultural landscape with its preponderance of level rice fields is interrupted by pagodas or the little hills of grass which protect the ancestral tombs from inundations.[8]

Just as Tonkin has the largest population in French Indo-China, so the delta of Tonkin has the greatest density. On its 5,700 square miles of land the delta supports 6,500,000 people, giving a density of 1,140 inhabitants per square mile. In some districts the density reaches the extremely high figure of 2,500 persons per square mile, thereby ranking among the most densely populated agricultural districts in the world.

Rice cultivation in Tonkin.—By reason of its population density, the delta of Tonkin is characterized by intensive cultivation, every effort being made to increase the yields as much as possible. Meanwhile, in spite of their great care and intensive methods of cultivation, the inhabitants—chiefly Annamites—obtain only moderate yields of rice, since rice only attains maximum yields in fertile soils or on lands kept fertle by heavy applications of manure. Now, the soils of many parts of the delta are quite poor and the peasant Annamites, deprived of basic mineral fertilizers and poorly provided with livestock, are not able to maintain soil fertility at a high level. Rice requires a regular system of irrigation. The crop dies if it receives too little water, and it dies if it is submerged. The peasants have not a sufficient amount of water at their com-

[8] *Ibid.*, pp. 424-426.

mand for purposes of irrigation during dry years.[9] Moreover, the Red River of the delta presents a double problem—that of fertilization as well as irrigation. Its waters are well supplied with silt, but it is subject to excessive rises at times, and consequently danger of floods. If the waters of the Red River were, therefore, permitted to flow uncontrolled over the lands, depositing its valuable load of silt, destruction of property and life would be great. Hence, by reason of the fact that the delta is sought for intensive tillage and great numbers of people have been attracted to the region, the river and its tributaries have been diked and are subject to a constant control. This situation explains why the Red River is not generally used for irrigation and why so much silt is lost to the land; it also suggests that the lower lands in the delta may remain inundated and waterlogged for some time, since the natural channels of drainage are too elevated to be of value in removing the surplus water. Moreover, to cut the dikes and thereby utilize the waters of the river for purposes of irrigation would involve too great a risk.

Laos.—Laos, like northern Siam, is a sparsely populated highland region. Although it is the largest political unit in French Indo-China, Laos contains the smallest population, that is, approximately 850,000 people. The Laotians, who from a racial point of view constitute the leading group, are dispersed throughout the protectorate, whereas the other inhabitants of this region live in groups which are generally poorly equipped with the means of intercommunication. This region has been up to now very difficult to penetrate, although during the last few years a number of roads have been constructed, thereby opening up areas that hitherto had been considered inaccessible.

Since a large part of this region consists of rugged highlands, which in places are lacking in transportation facilities, the inhabitants practice a subsistence agriculture, chiefly the production of rice. In addition some rubber, cinnamon, lac, car-

[9] The climate of Tonkin, though humid, is subject to marked variations in precipitation.

damoms, and gum are exported. But the forests are more widespread than is the cultivable land, and forest products are generally considered the only exports of importance. As in northern Siam, teak is plentiful, but its exploitation is handicapped because of the poor transportation contacts with the commercial world.

Manufacturing.—Industrially, French Indo-China is a young country; modern manufactures have had but small beginnings, and she depends upon foreign countries, especially European nations, for the products of large-scale production in order to satisfy her local needs.

Of domestic manufactures, the most marked development has taken place in Tonkin, where the conditions are quite favorable. Coal of high grade is mined in this region and is an important factor in furthering industrial growth. Here several mills have been constructed for the spinning of cotton yarn; distilleries have been established; and other types of industries have been developed, such as rice mills, soap works, paper mills, and cement factories. Hanoi and Haipong are the chief industrial centers.

In Tonkin, as well as in other parts of the country, the industry is concerned primarily with the processing of raw materials, especially rice. Cholon, Cochin-China, is the chief rice-milling center, where great quantities of rice (2,600,000 tons annually) are processed and prepared for export trade.[10]

Commerce.—In normal years the foreign trade of French Indo-China reaches a value of more than $100,000,000 each of exports and imports; and there is normally a moderately good trade balance, exports and imports being approximately of equal value.

Rice, the leading export.—Among the chief exports of the country, rice, fish, coal, rubber, and lacquer are noteworthy. Of these, rice occupies a preëminent position. According to value it constitutes approximately 60 per cent of all commodities exported (65 per cent in 1930), and French Indo-

[10] Gouvernement General De L'Indochine: *L'Indochine Francaise, Exposition Coloniale Internationale,* Paris, 1931, pp. 40-42.

China ranks with Burma and Siam as one of the three major rice-exporting countries of the world.

Cochin-China is the chief rice-exporting unit of the country. Although Tonkin is a strong competitor in the production of rice, Cochin-China has a lower population density and therefore a greater surplus. Most of the rice produced in French Indo-China that is destined for world trade, therefore, leaves the port of Saigon, Cochin-China.

Imports consist mainly of manufactured goods.—Since French Indo-China has made but small beginnings in modern manufacturing, she is dependent upon the outside world for a variety of finished commodities for the satisfaction of her material wants. Among these imports we find cotton fabrics, machinery and apparatus, metal manufactures, iron and steel, and silk fabrics. The imports are obtained mainly from France (54.7 per cent of all commodities imported in 1930).

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CHAPTER XVII

The Netherlands East Indies—Java

General characteristics.—Consisting of a large group of tropical islands, the Netherlands East Indies include Java, Sumatra, the major part of Borneo and New Guinea, the Moluccas, and many others. For administrative purposes these islands are divided into two groups: (1) Java and Madura, and (2) the Outer Provinces. With regard to population and commercial interest, Java and Madura constitute the most important and highly developed division. Of the Outer Provinces, Sumatra is being developed rapidly at the present time. It is more than three times the size of Java, whereas its population is less than one-fifth as large. Borneo and New Guinea are even larger. They contain vast undeveloped and even unexplored areas, and their inhabitants are mainly semi-savages.

Located close to the equator, the Netherlands East Indies have high temperatures throughout the year, an abundant rainfall, and are therefore capable of producing large quantities of tropical products, such as rice, rubber, sugar, tea, spices, and coconuts. Here the spice trade has had a long and important history, and the Molucca Islands are still a major source of nutmegs, cloves, and mace. But spices are no longer the chief commercial products of the Netherlands East Indies. These islands have played an important rôle in the phenomenal expansion of the plantation rubber industry of southeastern Asia, and they rival British Malaya in the commercial production of this commodity. Java has become the leading source of quinine and ranks as one of the three leading producers of cane sugar in the world.

The commercial development of the Netherlands East In-

dies has attracted the attention of leading industrial nations. Thus the two hubs of commerce—eastern United States and western Europe—are drawing heavily upon the islands' tropical resources. On the other hand, this archipelago constitutes a good market for various manufactured goods of industrial nations.

Java as a producer and consumer.—Of the Netherlands East Indies, Java stands out as the most important political unit. Although Java (with Madura) occupies only 51,200 square miles of land, or seven per cent of the total area of the Netherlands East Indies, it is so far in advance of the other islands from an economic geographic point of view that the others are referred to as the "Outer Possessions." The commercial production of this island is of world-wide significance; for Java constitutes the chief source of kapok, tapioca, and quinine, is one of the three leaders in the production of cane sugar, and accounts for a number of other commodities, such as rubber, tea, and coffee. Rice, however, shows a greater acreage than any other crop, but it is produced mainly for local consumption.

The total value of commodities exported from Java almost equals that of the remainder of the Netherlands East Indies, whereas the imports by far surpass those of the Outer Possessions.[1]

Java is, therefore, the outstanding consumer as well as producer in the Netherlands East Indies, and it is also noteworthy that the import requirements of the Outer Possessions consist mainly of estate supplies and construction materials, whereas those of Java are largely for the native population.[2]

Population density.—Another yardstick of measurement pertaining to the significance of Java is found in examining the population density of the island. For a country depending

[1] For the period 1926-1931 Java's average annual exports amounted to $268,-101,000, whereas those of the Outer Possessions were valued at $275,000,000. The imports, on the other hand, were highly in favor of Java, with $222,628,-000 for Java and only $125,000,000 for the Outer Possessions.

[2] "The Purchasing Power of Java's Native Population," *Commerce Reports* (April 30, 1928), Washington, D. C.

almost entirely upon agriculture, it is the highest in the world.[3] Although she possesses large areas of steep-sided and rugged volcanic highlands, Java contains 41,719,000 people (1930), giving the island a density of approximately 815 persons per square mile. This population density surpasses that of either Belgium or the Netherlands, and it is more than four times as large as that of France. Although parts of China, India, and Japan have population densities surpassing that of Java, the average densities of the former countries are much less than that of this small island. Moreover, some parts of Java are also much better suited for human occupancy than other parts, as indicated by the fact that certain districts in eastern Java contain more than 2,000 people to the square mile.

Major reasons for Java's significance.—Java's importance as a densely populated producer and consumer of economic goods is due to a number of factors, some of which are geographic, others non-geographic. In weighing the advantages and disadvantages of this island a number of favorable factors may be recognized: (1) location with respect to Asia, Australia, and the Strait of Malacca; (2) a fertile soil developed in parent materials of recent volcanic origin; (3) a climate which is conducive of productivity; (4) a racial element which is industrious and accepts readily the introduction of sanitary measures; and (5) a colonial system that has functioned quite satisfactorily in this part of the world.[4]

With respect to the last factor, it is noteworthy that the country has long been under the influence of the Dutch Colonial system. But even before its existence was known to Europeans, Java had attained a considerable degree of civilization under the Hindus, who founded several independent states. Visited in 1520 by Portuguese traders, the island was later overcome by the Dutch (1596). Since then Dutch political control was lost only during the short period 1811 to 1817, when the British took possession of the island.

[3] Van Valkenburg, S.: "Java, The Economic Geography of a Tropical Island," *The Geographical Review*, Vol. XV (1925), p. 563.

[4] *Ibid.*

Racially the natives are of Malay stock, although in the eastern part of the island Polynesian influences are evident. The island has long attracted the immigrant; first the Indian Hindu, then the Arab with his Mohammedan religion, and over a long period the Chinese have established themselves, mainly as traders. Today the Chinese are the most numerous of the foreign element.

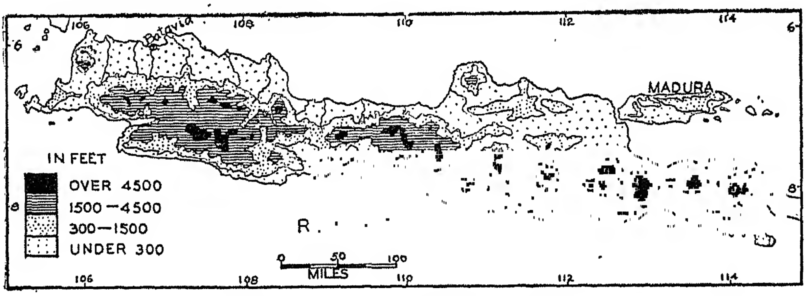

Fig. 109.—The relief of Java.

The sanitary conditions are decidedly better than one will find in the surrounding countries. The average death rate for Java is approximately 20 per 1,000, whereas the Federated Malay States (32 per 1,000), British India (30 per 1,000), and the Philippines (23 per 1,000) all show less favorable ratios. The low death rate is due in large measure to the application of scientific measures in the fighting of disease and the efforts made to develop more sanitary conditions. Thus malaria, the principal disease of the coastal districts, is kept in check by costly drainage works, the use of mosquito curtains, and the consumption of proper foods and drugs.

In order to better understand the environmental assets and liabilities of Java, a brief analysis of the island's physical equipment may be made.

The natural environment.—Structurally a part of a huge fold in the earth's crust, the Sunda fold, Java is extremely mountainous, and is distinctive in the great number of volcanoes scattered through its interior highlands (Fig. 109). The mountainous region, therefore, consists of young volcanic rocks which disintegrate rapidly in the warm, humid climate,

and weather into a deep rich soil that is given to agriculture, even on relatively steep slopes. In fact, agriculture is widespread up to elevations of approximately 4,800 feet, above which forests predominate in the natural landscape. But it is an error to think of Java as an island that is entirely volcanic in character, since extensive alluvial areas are found in the peripheral zones, chiefly in the northern coastal region; and

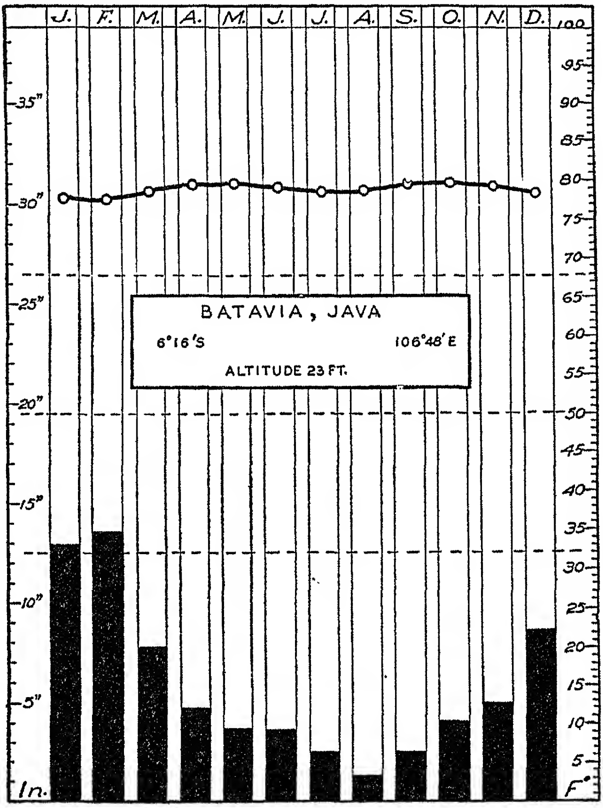

Fig. 110.—Temperature and precipitation during the year at Batavia, Java.

sedimentary formations are widespread. When the present peripheral areas were shallow seas, sediments were washed down from the central volcanic core and deposited, forming the sandstones, conglomerates, and limestones. Subsequent elevation of the earth's crust in this area resulted in the widespread distribution of sedimentary rocks. Here weathering

proceeds with great rapidity and the abundant rainfall favors rapid erosion, hence the disintegrated volcanic and sedimentary materials are washed into the coastal lowlands, where they are deposited in the form of alluvium. These alluvial lowlands are widespread in the north, where they are almost entirely given to agriculture, although in some places they are fringed with mangrove swamps. In the south coastal region, on the other hand, the surface is bold and rocky, and this area lacks the accessibility to the interior afforded by the northern lowlands.

Located in the tropics at a distance of only a few degrees from the equator and surrounded by tropical waters, Java reflects a rainfall and temperature regime that is quite characteristic of humid tropical regions.[5] The temperature is remarkably uniform throughout the year, as indicated at Batavia (Fig. 110). Precipitation, however, shows a marked seasonal distribution in practically all parts of the island, but especially in the coastal regions, since the island is under the influence of atmospheric movements—the monsoonal air currents that move from the west and northwest during December, January, and February and from the southeast during July, August, and September. Thus the southern parts of the island get a maximum amount of precipitation when the monsoon blows from the southeast, whereas the northern and western parts receive their maximum during the period when air currents come from the northwest. In general the western parts, especially the highlands, receive the greater amount of rainfall (Fig. 111). Striking contrasts are often found between windward and leeward slopes, due to the local convection in the highland districts, the rising air currents causing maximum amounts of precipitation on the windward slopes.

Climate and soils favor a luxuriant covering of native vegetation. Palm trees are widely distributed and are rather scattered in their growth, whereas the useful bamboo covers extensive highland areas. In the mountains above the zone of agricultural production, forests are widespread, Government for-

[5] Java lies between 5°52′34″ and 8°46′4″ S. latitude.

ests covering approximately 7,408,000 acres of land in Java. In the poorly drained peripheral lowlands of the island, mangrove plants form narrow fringes of vegetative growth.

Native agriculture.—Favored by soil and climate, Java is one of the most important spots for tropical agriculture. The Javanese are essentially farmers, and agriculture is the main factor in the economic development of the island. Two distinct types are generally recognized—the small scale native type of agriculture and the large scale plantation system oper-

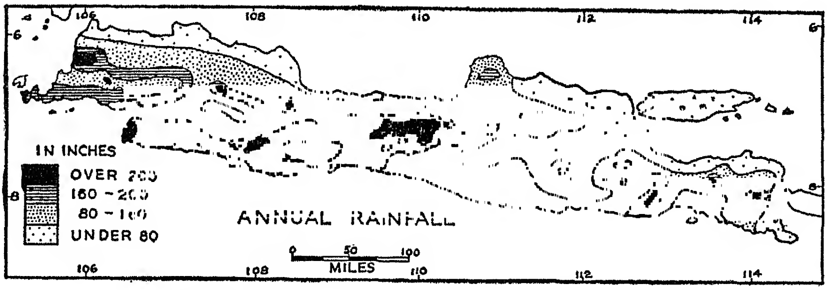

Fig. 111.—The average annual rainfall in Java.

ated by Europeans.[6] Java and Madura have (1930) approximately 18,800,000 acres, or 57.5 per cent of their total area, under native culture, and 1,700,000 acres, or 5 per cent of the total area, devoted to plantations operated by Europeans. From the standpoint of land utilization, therefore, the native agricultural industry is the more significant and is favored through legislation emphasizing the utilization of sufficiently large areas of land for the production of foodstuffs. Noteworthy among the crops of plantation or estate agriculture are sugar cane, rubber, tea, coffee, tobacco, and cinchona, whereas the native agriculture centers mainly about the production of foodstuffs, especially rice.

Rice production.—Rice is the keynote of the native agricultural system, and more than 250,000,000 bushels constitutes an average annual yield. Nearly the entire irrigated area, some 8,000,000 acres, is devoted to rice, the unirrigated or dry-

[6] See *Reports on Commerce, Industry, and Agriculture in Netherlands East Indies*, recent years, Division of Commerce, Buitenzorg, Java.

grown paddy (gogo paddy) occupying only a small percentage of the land given to unirrigated crops (Fig. 112). In spite of the large production, however, rice is imported in large quantities (35,000,000 lbs. in 1930) in order to satisfy the demands of this densely populated island.[7]

Irrigation is of major importance in the production of rice, and almost all of the rice in Java is grown on irrigated fields. Since the precipitation in many districts is insufficient and too irregular to meet the requirements of the rice crop, irrigation is essential. The variation in some districts between maximum, normal, and minimum stream flow attests the necessity for artificial control. In fact, there are records of streams that vary from 90,000 cubic feet per second during heavy floods to low marks of only 810 cubic feet per second.[8]

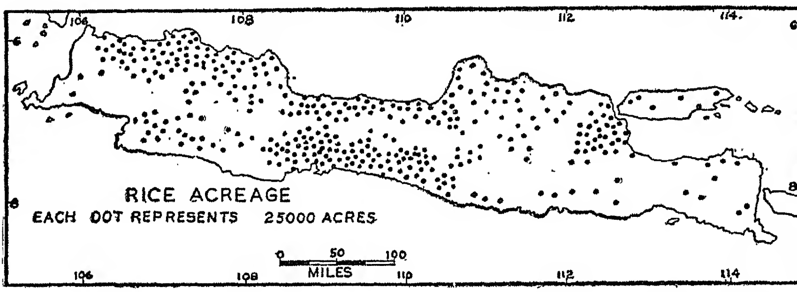

Fig. 112.—Geographical distribution of Java's rice acreage. (After Van Valkenburg, with modifications.)

Rice is grown not only in small fields surrounded by dikes in the lowland areas, but its cultivation extends well up into the highlands, in some places to elevations of more than 3,800 feet above sea level. In some districts, slopes with gradients of approximately 45 degrees have been converted into huge stairways of rice terraces, reminding one of the highland rice agriculture of Ceylon and the Philippines. In the highlands of Java, especially the western highlands, rice may be seen in all stages of growth, since rice cultivation, generally speaking, is

[7] In general, rice alone cannot supply a sufficient amount of food for more than 650 people per square mile.

[8] Van Valkenburg, S.: "Java, The Economic Geography of a Tropical Island," *The Geographical Review*, Vol. XV (1925), p. 574.

uninterrupted. In the lowlands, on the other hand, the rice plants are set out at the beginning of the rainy season, whereas harvest is associated with the dry period of the year.

Other major native crops.—Where rice is grown only during the rainy season, it is a common practice to produce other crops on the same land after the period of rice harvest. Moreover, various other crops occupy some of the better drained lands even during the wet season. Distinctive among these other agricultural products is Indian corn or maize, which covers approximately 12,500,000 acres. Sweet potatoes, cassava, kapok, and legumes also play an important rôle in the system of native agriculture.

Cassava.—Cassava is the name given to the roots of a semi-shrubby perennial plant, which may reach the length of more than three feet and have a diameter of approximately six inches. These large roots yield the tapioca of commerce, tapioca being formed when moist cassava starch or flour is properly heated on iron plates. The granules rupture, forming irregular pellets that become hard and translucent when cooled.

Java and Madura constitute the chief source of supply, with a production of 7,000,000 tons of cassava roots yearly on approximately 2,000,000 acres of land. Here the cassava is not only one of the principal foods but also a major source of wealth. These islands export approximately 90 per cent of all the tapioca of commerce. In normal years the United States is the largest consumer, importing more than 100,000,000 pounds. Most of the cassava cultivation is found in central and eastern Java, on approximately 84 per cent of the total acreage of the island.

The production of tapioca is essentially a native industry, small dealers buying the dried roots and selling them to the many mills located in this area. The mills must have the material well dried before grinding, and the better ones keep it in stock three or four months for that purpose. Some mills grind the root too wet and produce an inferior product with a free moisture content sometimes as high as 7 per cent whereas

the product of the better mills contains less than 2 per cent moisture.

Kapok.—Practically the entire commercial supply of kapok is obtained from Java. Used in the manufacture of mattresses, pillows, and life preservers, kapok became an important article in the commercial world during the War, when cotton linters were required for purposes of warfare. Today the United States imports more than $2,500,000 worth of Java's kapok annually ($2,600,000 in 1930).

In the cultural landscape of Java one sees kapok trees mainly along the roadsides or on the ridges bordering paddy fields. It is, therefore, a widely scattered native industry, with perhaps not more than eight per cent of the total acreage under estate control. But this native industry suffers from the fact that the natives, who fear the theft of their easily stolen crop, pick the kapok pods before they are fully ripe, resulting in a product of lower quality. The harvest generally begins early in September, when the color of the pods becomes a light brown.[9]

Products grown for export.—Although some of the products of native agriculture, such as cassava and kapok, are produced in large quantities for export, the crops grown on plantations are relatively more important in this respect. Certain crops, moreover, are grown not only on plantations but also by the natives, under the control of Europeans. Distinctive among the latter is sugar cane.

Sugar cane production.—In the production of cane sugar Java ranks third in the world, with an average annual output of 2,634,000 short tons during the ten-year period 1922-1932,[10] and the island is often referred to as the "sugar bowl of the East Indies." Of Asiatic countries Java functions as the most important source of supply with respect to the international trade in sugar. Even India, second largest producer in the world, by reason of her large population imports more sugar

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[9] *Commerce Reports* (Nov. 18, 1929), Washington, D. C., p. 414.

[10] During this period Cuba produced 4,892,000 tons and India 3,465,000 tons annually

than she exports, the greater part of it coming from Java.

In studying the trends of sugar production in Java, one finds that the acreage has trebled since 1890 and the yield per acre has increased to an even greater extent, so that today Java is essentially singular in her high yields per acre. In normal years the production of more than 3,000,000 tons occurs on approximately 500,000 acres, a yield of 6 tons of sugar per acre, as compared with only a ton in Indo-China, Siam, and India, and even less in Brazil. Such high yields per acre are associated with low production costs, with some of the most efficient plantations claiming a production of sugar for less than a cent a pound.

An interpretation of the development and present status of this industry takes into account human as well as physical environmental factors. Thus, the human factor has functioned effectively in selecting high yielding, disease-resistant strains of sugar cane. Some of the first work along this line started during the last quarter of the nineteenth century, when the sereh disease made deep inroads into the sugar business. As a result of scientific experimentation, a strain of sugar cane was developed that proved not only immune to the sereh disease but also gives a uniformly high yield per acre.

In densely populated Java, production costs are kept down partly because of the low wages paid workers in the sugar industry. On the sugar estates and in the sugar mills the coolie wage is generally less than 20 cents a day, whereas average farm hand wages are only approximately 15 cents a day. In this respect Java has an advantage over some of the more sparsely populated adjacent islands, such as Sumatra, Borneo, and Celebes, in some of which coolie wages may be approximately three times as high.

The system of land tenure further aids the industry. Unlike Cuba, where cane is frequently grown on recently cleared virgin land, the sugar fields of densely populated Java are worked in rotation on land that belongs to the natives and is leased by sugar companies. The tenure system calls for the production of only a single crop of sugar from a given area, the land being

returned to the natives for a two-year period of native agriculture with its rice, maize, cassava, legumes, and other crops. Thus a rotation is established, which accounts in large measure for the maintenance of soil fertility and the high yields per acre.

A study of the distribution of the sugar cane acreage discloses a concentration of production in central and eastern Java (Fig. 113). Cane reaches its optimum development in

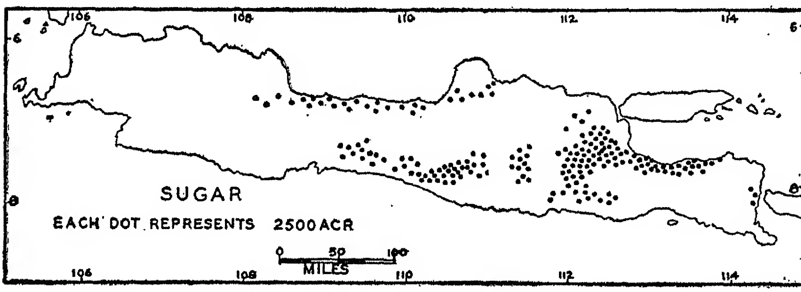

Fig. 113.—Geographical distribution of Java's sugar cane acreage. (After Van Valkenburg, with modifications.)

tropical areas which have a seasonal rhythm in rainfall. A frost-free region is necessary, since the large, heavy-yielding varieties of sugar cane frequently require more than twelve months to reach maturity. But cane also does best where the season of harvest is not too wet. Central and eastern Java with their more pronounced dry season and their more extensive areas of level lowland are, therefore, better suited to sugar cane production than the humid western highlands.

Tea.—Among the tea exporting regions, the Netherlands East Indies are third in rank, with a trade predominantly in black tea.[11] Of these islands Java is the major producer, with more than 225,000 acres devoted to the crop. This acreage is concentrated chiefly in the western volcanic highlands of the island, especially on lands ranging from 1,500 to 3,500 feet above sea level. Here a well distributed and abundant rainfall (150 to 200 inches) combines with uniformly high temperatures,

[11] Trewartha, Glenn T.: "The Tea Crop," *The Journal of Geography,* Vol. 28 (Jan., 1929), p. 14.

making possible a continuous picking of tea leaves throughout the year (Fig. 114). In addition, the highland slopes contain dark-colored, deep, friable loam soils that are well drained. The heavy rainfall, however, necessitates terracing in order to check destructive soil erosion.

In the international tea markets the Javanese product is generally considered of lower quality than the teas of Ceylon, northern Bengal, and the Brahmaputra Valley. A major reason for the medium quality of the Javanese product, is that a relatively large acreage of tea is owned and worked by the natives on small patches of land. These small tea gardens, unfortunately, are not worked so scientifically as are the Javanese tea estates.[12]

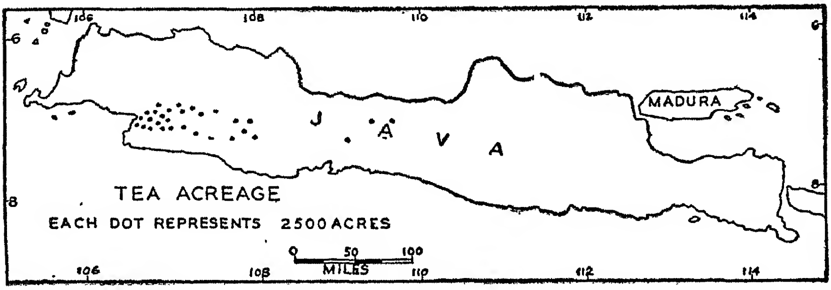

Fig. 114.—Geographical distribution of Java's tea acreage. (After Van Valkenburg, with modifications.)

Rubber.—Java is a major rubber producing unit of the Netherlands East Indies, with more than 530 estates given to the production of this commodity as compared with approximately 450 estates in the "Outer Islands." The latter islands, however, contain a larger acreage. In Java the areas of most concentrated rubber production are generally found at elevations somewhat lower than the more important tea-producing units. Moreover, most of the rubber estates of Java produce rubber in combination with other crops, such as tea and coffee. On the lower highland slopes of east Java, coffee is commonly

[12]Reynst, A. E.: "Java and Sumatra Tea Estates," *Tropical Agriculture*, V. 1, 2, No. 12 (March, 1926), pp. 58-59, and "Java, Its Life and Its Tea," *The Tea and Coffee Trade Journal*, Vol. 45, No. 2 (Aug., 1923), pp. 197-200.

grown in combination with rubber, whereas in west Java tea is the accompanying crop (Fig. 115).

In Java, as well as in the other parts of the Netherlands East Indies, a large share of the total output of rubber is produced by natives on their small, scattered holdings. It is therefore exceedingly difficult to maintain a high price by limiting the output of this commodity in the East Indies-Malay region, since the numerous native holdings are not readily suscepti-

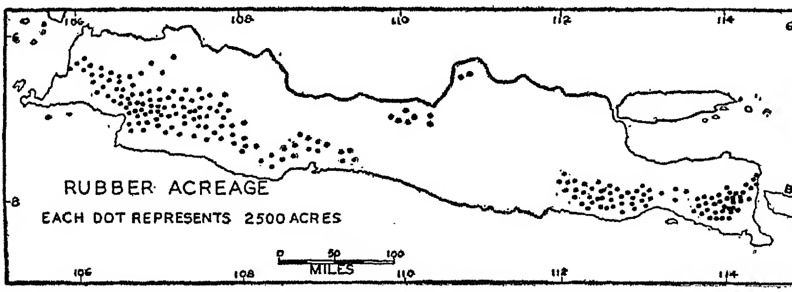

Fig. 115.—Geographical distribution of Java's rubber acreage. (After Van Valkenburg, with modifications.)

ble to control and regulation with respect to production. This fact is well illustrated in the failure of the Stevenson scheme, which was a British plan to restrict the production of rubber in Malaya and Ceylon. But British companies in the Netherlands East Indies volunteered to be guided by any scheme that might be effective in Ceylon and Malaya. Cooperation was sought from the Dutch growers in the Netherlands East Indies, chiefly in Java, Sumatra, and Borneo; but the Dutch declined to act. Thus the Stevenson scheme, which came into operation on November 1, 1922, failed to maintain high prices for rubber. On the other hand, it led to an increase in production outside of Ceylon and Malaya, especially in the native industry, and to a larger use of reclaimed rubber. Prices for crude rubber declined sharply, and the scheme was abandoned in 1928.

Cinchona.—Java is the world's most important source of quinine, which is obtained from a tree indigenous to tropical South America. The Dutch brought a few species of cinchona

trees to the East Indies.[13] Here scientific research has resulted in the development of a strain of cinchona with six per cent of quinine as compared with the usual two per cent in the ordinary wild cinchona trees grown in Peru. In Java the cinchona acreage occurs mainly in the western part of the island.

Manufacturing and commerce.—Java's manufacturing industry centers mainly about the processing of local raw materials, especially the products of agriculture. Moreover, the manufactures are produced chiefly for local consumption, with the exception of bamboo and pandan hats, which enter the foreign trade in large quantities. Here the European factory system is as yet in its infancy, the products of large-scale production being significant products among the imports of the island. Java lacks the raw materials necessary for any considerable development of manufacturing. Her mineral reserves are very small, the only mineral of any importance being petroleum produced in the Rembang and Soerabaja districts.

Java's foreign trade consists chiefly of agricultural raw materials among the export and finished goods as the chief items in the import trade. Tea, rubber, cinchona, and spices are exported in large quantities from Batavia, whereas the sugar, tobacco, coffee, and fibers of central and eastern Java reach foreign markets mainly through the ports of Semarang and Soerabaja.[14] The imports consist chiefly of cotton piece goods, cleaned rice, and metal manufactures.

The most marked development in the foreign trade of Java traces back to the World War. Up to that time the status of the island's trade represented the steady but gradual development of the previous 300 years. With the outbreak of the war, attention was focused on various of the more or less remote but productive parts of the commercial world, and the Netherlands East Indies became an important source of vari-

[13] A genus of several species of evergreen trees belonging to the madder family, indigenous to the tropical valleys of the Andes, and yielding cinchona bark, the source of quinine.

[14] Van Valkenburg, S.: "Java, The Economic Geography of a Tropical Island," *The Geographical Review*, Vol. XV, p. 583.

ous necessary raw materials as well as a market for manufactured articles. With the temporary closing of European channels of trade, the agricultural industry of the island of Java flourished. The newly accrued wealth made possible large purchases of foreign products, chiefly in America and Japan.

The trade of Java is conducted chiefly with the Netherlands, the United States, Singapore, and the United Kingdom. It is, however, difficult to determine accurately the share of various foreign countries in the trade of Java, since there is a large amount of trans-shipment of goods through Singapore and Penang. Moreover, many products, when not marketed directly, are in many cases sent to Amsterdam. American buyers have shown a marked interest in Java's products, chiefly in rubber, kapok, copra, tapioca, and spices. In addition, a variety of minor products, such as bamboo huts, vanilla, rattans, gums, and resins, are finding markets in the United States. The Netherlands draw heavily upon Java's rubber, quinine, coffee, tea, spices, and fibers. In this connection it is important to note that the trade should be classified into (1) export and import of commodities and merchandise for private account, and (2) export and import for government account. The government exports from Java consist mainly of quinine, which is a Government monopoly. The British Isles purchase large quantities of rubber, tea, tapioca, and fibers in Java.

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CHAPTER XVIII

Sumatra, Borneo, and the Other East Indies

SUMATRA

Development.—Located astride the equator, Sumatra embraces more than 163,000 square miles of land, as compared with Java's 51,000 square miles. But its population is only 7,660,000, whereas the sister island has almost 42,000,000 people. The latter island is a densely populated "garden spot" in the tropics, whereas the former, with its large area and abundant resources, has had a retarded development, in part because of certain handicaps in the geographical environment. Although Sumatra lies on the channel of trade that has long been followed by Indian navigators and merchants who gathered various agricultural products in Java and spices in the Moluccas, its growth has not been in harmony with the advantage that would appear to be hers by reason of favorable location.[1] Some small coastal settlements early sprang up in the east coast region along the channel of trade (the Strait of Malacca), but the land remained very sparsely populated. These favorably located east coast lands with their true equatorial climate are handicapped because of swampy, unhealthful conditions. The western coast of the island, on the other hand, is less advantageously located than the eastern with respect to the trade channel through the Strait of Malacca, yet contains shallow island-protected indentations and anchorage places. Here the narrow coastal plain gives way to steep slopes that extend into the mountainous interior of the island. But greater proximity of the interior highlands to this western coast facilitated the settlement of the interior from

[1] De Leeuw Henrik: "Sumatra, Economic and Geographic," *The Bulletin of the Geographical Society of Philadelphia,* Vol. 28 (Jan., 1930), p. 16.

the west. In fact, the first Dutch expeditions for the exploitation of the interior highlands were undertaken from the western coastal lands.[2]

Another major handicap to the development of Sumatra has been the constant warfare, even until the beginning of the twentieth century. The island has, therefore, presented a more difficult problem to Dutch colonization than Java, and has offered much less incentive to settlers. The savage and semi-savage tribes had to be conquered. Although few in numbers, the inhabitants of Sumatra resisted foreign intervention and carried on a continuous guerrilla warfare, which was prolonged because of the abundant vegetation in these jungle covered lands. Each of the tribes and native states of the island had to be subdued, and the state of Atchin in the north was not under Dutch reign until 1904, when the Dutch were finally victorious after a long period of warfare (1873-1904).[3]

The most marked economic development in Sumatra has taken place during the present century, chiefly since the World War. Before 1914 the island was known to the commercial world merely for a few native products, such as gums, coffee, and copra, and for its cigar wrapper tobacco. With the rapidly increasing demand of rubber associated with the speedy development of the automobile industry, and with the increased consumption of palm oil, fibers, copra, tea, and other tropical products during and following the World War, capitalists were attracted to the island and plantation companies slashed their way into the jungle. Today the commercial world obtains large quantities of rubber, tobacco, tea, and palm oil from the plantations that have been established on this tropical island.[4]

The natural setting.—Like Java, Sumatra contains a highland interior that extends through the length of the island and

[2] *Ibid.*, p. 18.

[3] It is estimated that the Atchin war in Sumatra caused the loss of more than 200,000 lives at an expense to Holland of approximately $200,000,000.

[4] *Commerce Reports* (Nov. 11, 1929), Washington, D. C., pp. 339, 340.

contains a great number of volcanic cones, many of which are still active. This volcanic backbone lies near the west coast, extends throughout the entire island from southeast to northwest, and forms a broad highland north of 1° N. latitude (Fig. 116). In northern Sumatra, therefore, the highlands consti-

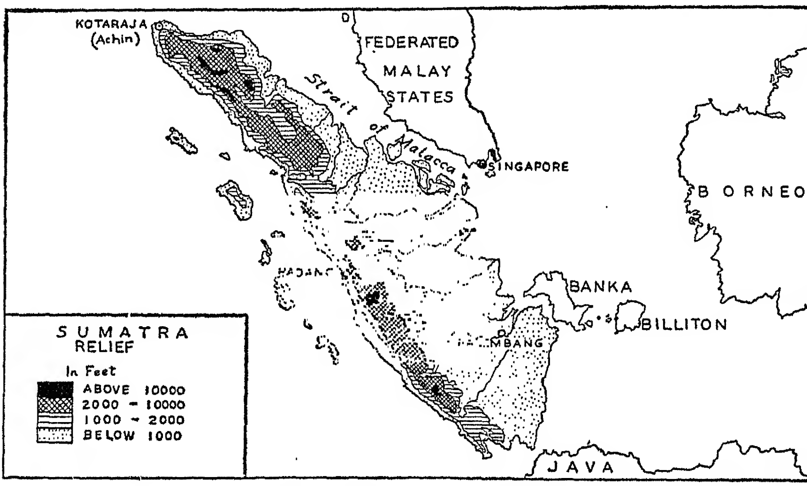

Fig. 116.—The relief of Sumatra.

tute the most widespread land form, whereas to the southeast they give way to more closely formed parallel ranges. The rocks of the highlands are sedimentary as well as volcanic in origin. It is the belief of some students of Sumatra's physical geography and geology that the older rocks are more widespread in Sumatra than in Java. Many of these older rocks weather into relatively poor soils, because they are acid and heavily charged with quartz; but where the basic rocks are found the quartz generally is absent, and the weathered surface material constitutes a better geographic base for agriculture.[5]

Terraces are located between the interior highlands and the lowlands, the latter having been formed from materials washed down from the mountainous interior. In this true

[5] De Leeuw, Henrik: "Sumatra, Economic and Geographic," *The Bulletin of the Geographical Society of Philadelphia,* Vol. 28 (Jan., 1930).

equatorial climate, chemical weathering is rapid; and the weathered material is subjected to rapid erosion because of the abundant rainfall.

The northern part of Sumatra contains a relatively narrow plain, whereas in the east coast region the plain broadens to approximately 170 miles, becomes narrower farther south, and expands once more to approximately 170 miles in the southeastern part of the island. These coastal plains are intersected by a number of river basins, each of which constitutes a separate geographical unit. Mangrove swamps fringe the coastal regions in many districts and facilitate the seaward extension of the plains. Spreading out a veritable labyrinth of surface roots that act as a framework for the accumulating mud brought down from the interior, the mangrove is a significant factor in making land in the peripheral districts of the island. This process is further facilitated by the distinctive characteristics of the mangrove. This tree propogates through seeds which germinate on the parent plant, subsequently falling upright into the bottom of the shallow muddy coastal water, where they take root.

Located between 5° S. and 5° N. latitude, crossed by the equator, and surrounded by tropical seas, Sumatra posseses a true equatorial type of climate with its abundant rainfall, uniform temperatures, and high atmospheric humidity. In this area the sun's rays are almost vertical the year around, and the number of hours of day and night varies but little from month to month. This directness of the sun's rays together with the moderating influence of the surrounding tropical waters suggest the climatic uniformity which is so characteristic of the island. The average annual temperature is approximately 80°F. The range between the average of the coldest and warmest months is only one degree in many of the coastal districts; whereas the diurnal range reaches five to six degrees Fahrenheit. The rainfall regime also shows a marked uniformity, although the range is greater than that of temperature. In general, these variations may be expressed in terms of periods of the year that are wet and others that are

"less wet," since there is a plentiful supply of rainfall at all times. May, June, and August are the driest months, whereas October, November, and December receive the greatest amount of rainfall. Precipitation varies not only from time to time, but also from place to place, especially with respect to altitude and exposure to moisture-bearing winds.

Climate shows a striking relation to the economic and social development in the island. Thus sugar cane production, which reaches a world-wide significance in Java, is of no commercial importance in Sumatra, since the latter island lacks the dry season essential for setting of the cane stools.[6] Moreover, the local variations in climate are matched by differences in human responses from place to place. The inhabitants of the coastal margin, where mangrove swamps grudgingly yield but a small space here and there for coconut groves and palm-thatched huts, contrast sharply with the dwellers of the interior highlands. The strong and intelligent Menangkabau and Bataks occupying parts of the more salubrious highlands attest the significance of this factor. In contrast we find the semi-savage peoples, such as the Orang Koeboe, who live in the more unfavorable parts of the coastal lowland. They live in thatched huts built on piles, and are engaged in hunting, fishing, and relatively primitive subsistence agriculture.

Occupations.—The people of the island show a great diversity in their economic adjustments to environment. Thus the modern plantation stands in sharp contrast to the small indigenous agricultural enterprises of the native. Along the shores and in the lower courses of rivers may be seen some sampans and dug-out canoes, with here and there bamboo-and-string nets of the coastal fishermen. Manufacturing is of but little importance. In general, the occupation which engages the greater number of Sumatra's population is agriculture, and this falls nicely into the two-fold classification: (1) the native agriculture; and (2) the plantation system under the control of Europeans.

[6] *Ibid.*, p. 33.

The tobacco industry.—The island of Sumatra remained essentially a virgin area until the last quarter of the nineteenth century, since the commercial world did not need the products which could be produced here, and the occupancy of the land was stubbornly resisted by the natives. The tobacco planters were among the first to capitalize the environment of Sumatra for the production of an important commodity of commerce; and, as the oldest European enterprise in Sumatra, the industry has been an important factor in the economic growth of the island. Production is confined mainly to high grade wrapper leaf. On the tobacco estates this takes the form of the well-known Deli leaf, which is used as a wrapper for high-grade cigars. Although attempts have been made to produce wrapper tobacco of equal quality elsewhere in the East Indies, the Deli leaf remains quite singular in its quality among the tobaccos grown in this part of Asia.

Constant cropping to tobacco causes rapid depletion of soil fertility unless remedial measures are practiced. Thus, on the larger estates only a small part (one-tenth to one-fifth) of the land is devoted to that crop, and the land lies fallow for five to ten years, with the exception of one year (usually the first) in which the natives are permitted to grow rice on the fallow land. Such soil-conservation practices become necessary in this low latitude island. Here chemical weathering is extremely active, essential mineral plant foods (nitrates, phosphates, and potash) are quickly removed from the soils, and lands given to open cultures, such as the growing of tobacco, need rest.

The large tobacco estates are located at a distance from the coast, in the lower rolling and gently undulating lands that lie between the highlands and the coastal plains. Some of the largest estates are located west of Medan in the northeastern part of the island, where the cultural landscape in many places reflects vast stretches of land devoted to tobacco, and even larger areas remaining fallow. The landscape is broken in places by long drying sheds and occasionally a native tree. In many areas rubber production has developed at the expense

of tobacco, since tobacco places heavy demands upon labor as well as the land. It is, therefore, not uncommon to find areas where long, thatched drying-sheds are surrounded by fields of newly-planted rubber trees.

Rubber production.—Just as Java and Sumatra are the two major tobacco-producing units of the East Indies, so they are also the chief producers of rubber, Sumatra possessing the larger area of the latter crop. Here both the indigenous *Fiscus elastica* as well as the imported *Hevea brasiliensis* are grown. The industry is under the control of plantation owners as well as natives. In 1930 the foreign-controlled plantations were chiefly Dutch, British, and American, followed by French, Belgian, Japanese, and Swiss interests. Concentration of production is found in the north and east coastal regions of the island.

The native rubber industry is well developed in Sumatra, and presents a serious obstacle from the standpoint of restricting output during periods of overproduction. The large native growers, that is, those who are in possession of large holdings and who depend upon hired laborers to tap their trees, have little objection to restriction, since such practice would benefit them as well as the European planters. The family tappers present a different situation. They grow rubber as a side line, and since their cost of producing this commodity is very low and their own production is not restricted, they have much to gain and but little to lose from restriction of plantation rubber production.[7]

On the plantations the yields per unit area greatly surpass those of the native growers. In a study of the statistics (1930) pertaining to north Sumatra's rubber industry one finds that the American plantations outrank those of other nationalities in production per unit area.[8] The tapping methods of the native growers are so destructive that the productive life of the tree is short. The family tappers, in fact, begin to extract

[7] See *Commerce Reports* (June 22, 1932), Washington, D. C., p. 712.

[8] In 1930 the American plantations showed a production of 604 kilos, the Dutch 421 kilos, and the British 341 kilos on a hectare of land.

latex before the proper tapping stage has been reached, and, as a rule, cut so deeply into the tree that disease infected wounds develop. Moreover, in the native gardens rubber is commonly grown along with other crops.

Palm-oil industry of Sumatra.—The palm-oil industry is another of the distinctive types of agricultural production in Sumatra. The rapid recent development of this industry has been due to the possibility of overproduction of rubber and to the realization of the soundness of the principle which emphasizes the carrying of eggs in more than one basket. The dependence upon a single product such as rubber carries with it an element of danger. Thus the palm-oil industry has been added to the various other lines of production in the island, and today Sumatra and West Africa are the major producers of this commodity.[9]

Although the oil-palm trees are not indigenous to Sumatra or to any part of the East Indies, they have been developed into a finer strain and produce a larger and better grade of oil than do those growing in West Africa, their original habitat. One of the noteworthy features of Sumatra's palm-oil industry is the concentration in one district, the Province of Sumatra East Coast. Other areas have some production, such as the Lampong Province in the southernmost part of the island, and the industry has even spread across the Straits of Malacca to coastal British Malaya, but these areas are only of minor significance as compared with Sumatra East Coast. According to a survey of the oil-palm industry of Sumatra and West Africa published in the United States *Trade Information Bulletin,* No. 471, this area possesses a number of advantages, among which may be noted: (1) large tracts of virgin land; (2) extremely favorable climate; (3) fertile soil; (4) cheapness of rental rates; (5) cheap and good labor; and (6) the open-door policy of the Netherlands Indies Government, which is favorable to participation of foreign capital.[10]

[9] Redecker, S. B.: "Palm-Oil Industry of Sumatra and West Africa," *Trade Information Bulletin,* No. 471, Washington, D. C.

[10] *Ibid.,* p. 5.

Native agriculture.—To the island's tobacco, rubber, and palm-oil may be added other plantation crops, such as tea, coffee, copra, fibers, and spices. On the native holdings these crops are often found in the same fields. Thus coffee is commonly grown in the shade of the rubber trees or under the protection of large coco-palm trees. Spices may be found in the same field, climbing the trunks of the small trees. Nearby one may find fields of rice, cassava, and small patches of fibrous plants.

In contrast to the excellent methods of rubber, tobacco, and other plantation production, subsistence crops, including rice, root crops, pulses, maize, and a few stalks of plantain and fibers, show primitive conditions. Planted in small scattered patches, these crops receive but little attention in most parts of Sumatra. In some places lookout towers are erected in order to frighten feathered marauders. These towers are made of bamboo, with long strings fastened to them extending to various parts of the rice field. Small bits of cloth are tied to the rattan strings, and waft in the air as the watchman with hoots and yells strikes the bamboo poles, thereby frightening the birds from the growing fields of grain.

Of the livestock, chickens and hogs are ever present. They are generally found about and under the thatched native huts, picking up whatever they can find to eat. The water buffalo is widely used as a draft animal in Sumatra. On the highways of the island, water buffaloes are commonly seen drawing two-wheeled ox-carts, the latter generally being covered with a roof of thatch.

The people.—The native inhabitants of Sumatra fall into two major classifications: (1) the coastal peoples; and (2) the highland tribes of the interior. The coastal peoples show a much less advanced state of development than is found among the interior tribes, except in the plantation regions of the east and north coasts, where the natives have come in close contact with foreign elements. In some coastal districts, however, the people remain in a semi-savage condition, as for example, the Orang Koeboe. The less advancd of these peo-

ple live by hunting, fishing, and primitive agriculture. The interior highlands are occupied by stronger and more intelligent native peoples, among which are found the Bataks and Menangkabaus. These highland dwellers, like the coastal peoples, live in thatched houses, all of which are raised on stilts. This practice of building the houses on poles well above the ground suggests that the highland peoples in all probability have migrated from the coastal areas of the island. Some of the buildings are beautiful multi-gabled structures, with brilliant colored matting filling the triangular spaces in the gables. The immense roofs are frequently double-decked structures made of heavy thatch,[11] and attest the abundant rainfall of this area. The inhabitants are socially knit together in small groups, each of which consists of a cluster of huts erected around a large central building. In each village agriculture is the chief source of wealth, with hunting and fishing the supplementary activities. These villages are small and widely scattered, giving the highlands a sparse population. On the basis of a more complete utilization of resources, it is claimed that this region could support several times the present number of people.

By reason of the sparsity of the native population, the plantations depend to a great extent upon imported labor, especially Javanese, Chinese, and in smaller quantities Banjarese from Borneo and Tamils from southern India. As in other parts of southeastern Asia, many of the Chinese workers became traders and quite commonly accumulate a considerable surplus of wealth where natives can earn only a fair livelihood. Great numbers of Javanese laborers are obtained through contracts, and are often paid a month's wages in advance, or perhaps given a new sarong.[12] But there are also contractors seeking labor for other parts of the Malayan region, who persuade the Javanese coolie to break his original contract. In general the Javanese is a fair laborer, but he finds the climate of Sumatra less suitable than that of his

[11] Made from the leaves of the atap palm.
[12] Chief article of dress worn in the Malayan region.

native island. He enjoys his little comforts and luxuries, the rice harvesting, the feast days in his native Java, and he is quite reluctant to forego these for the uncertain inducements of foreign areas.

BORNEO

Physical setting.—With its large area, sparse population, and abundant resources, Borneo awaits development of its land and resources. Here the natural environment is similar in certain respects to neighboring islands in the East Indies, yet there are differences. The uniformly high temperatures and humidity throughout the year, associated with an abundant, well-distributed rainfall, give the island a tropical rain forest climate. Nearly all of the island, even the highland interior, is covered with a dense tropical forest. In the inter-stream areas the native vegetation takes the form of a true equatorial rain forest, with its heavy upper canopy of leaves and branches and its lower bare tree trunks. The rock structure, however, is quite strikingly different from that of other East Indies. The latter are mainly of volcanic origin, whereas Borneo consists chiefly of ancient igneous rock masses, which contain but small traces of volcanic activity. From the interior ancient-rock highlands, long rivers wind their way to the coast. These are much used by the natives of the island.

The people.—Borneo is perhaps better known in foreign lands for its type of people rather than for any other element or factor of its geographical make up. It is commonly believed that nearly all of the inhabitants consist of savages, but this does not agree with the actual facts. With a total population of approximately 3,000,000, the island is inhabited chiefly by Dyaks (Dayaks), Malays, and Chinese. Europeans number only about 3,500. As the aboriginal inhabitants of Borneo, the Dyaks consist of two groups: (1) the people of the coastal districts; and (2) those of the interior. The coastal Dyaks show intermixture with Malays. They mingle and trade with the Malays. The Dyaks of the interior, on the

other hand, are of relatively pure racial stock. They are engaged as hunters, till small patches of land in the tropical forest, and collect forest products, such as resin, rubber, and gutta-percha. Various of the tribes of the interior still practice head-hunting, an activity that has been subdued among the coastal Dyaks. As compared with the Dyaks, the coastal Malays are more highly civilized. They cultivate the soil, keep livestock, and depend in part upon the products of the off-shore waters. Like the Chinese living in other parts of the East Indies, those of Borneo are engaged in trade, mineral exploitation, and local business. These people come mainly from the Canton delta region of south China, and quite commonly return to their homeland after they have accumulated money in distant lands.

Agricultural products and natural resources.—Commercial production of agricultural commodities is confined mainly to the coastal regions. The true equatorial rain forest climate of the island favors the commercial production of rubber, which is cultivated in native plantations as well as in those under the management and supervision of Europeans. The more important plantations are located at no great distance from the coasts of British North Borneo. In the coastal districts of British as well as Dutch Borneo, the Malays and Chinese are engaged in the agricultural production and the preparation of coconuts and by-products.

Of the minerals, petroleum is an important factor in the modern economic life of the island. The largest proven oil field, the so-called "Koetei field" of Borneo, is located in the east coast region (Fig. 117). Other oil fields are found in northeastern Dutch East Borneo and in the British possessions in the northwest. At Balikpapan on the east coast of the island is located the largest oil refinery in the Dutch East Indies.

Trade.—From Borneo a number of commodities enter the channels of commerce. These include petroleum, rattans, gold, timber, rubber, diamonds, wax, gum damar, fish, copra, and camphor.

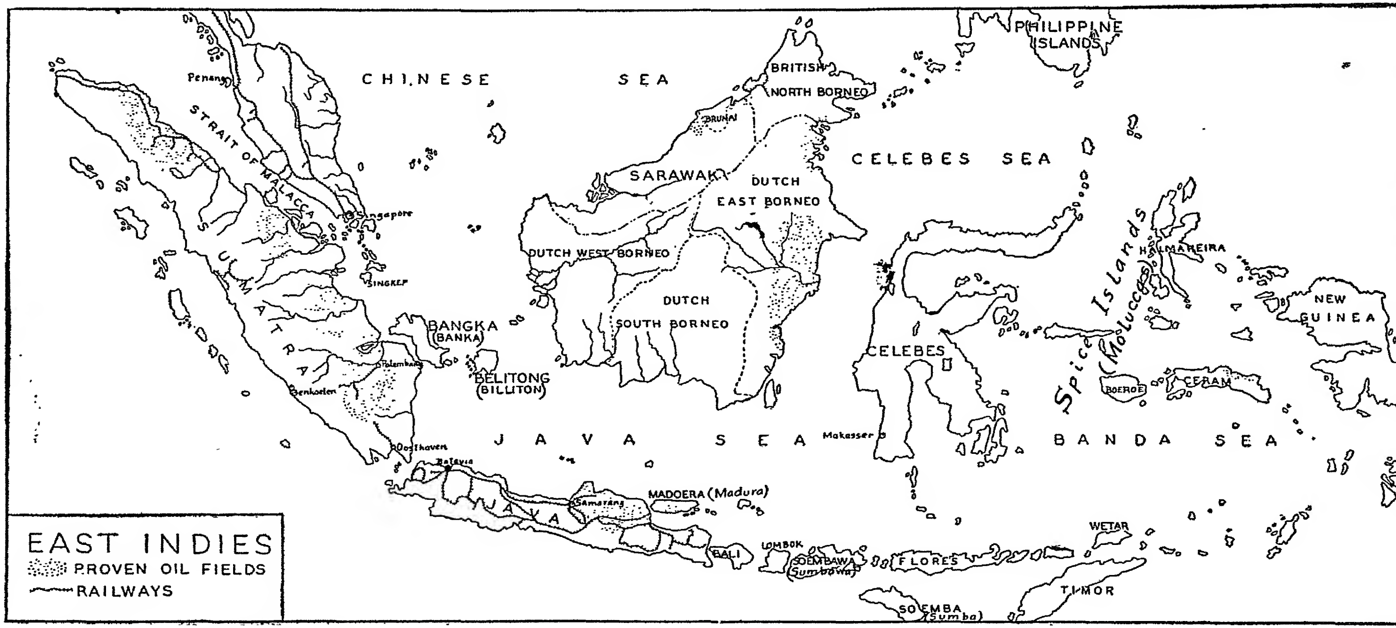

Fig. 117.—Map of the East Indies showing relative position of islands, chief railways, and proven oil fields. (After U. S. Department of Commerce.)

Foodstuffs and finished manufactures are the chief groups of imports; such as, rice, flour, cloth, ironware, kerosene oil, and machinery.

OTHER EAST INDIES

Bangka (Banka) and Belitong (Billiton).—Located between Sumatra and Borneo, Bangka and Belitong are distinctive in the commercial world chiefly because of their important tin reserves and tin production. These small islands are the chief tin producers of all the East Indies, and account for approximately 16 per cent of the world's output of this metal.

Agricultural production is confined largely to the growing of rice, pepper, coffee, and coconut palms. The staple foodstuff is rice. Pepper is produced very largely by the Chinese.

More than one-third of the total population of the islands are foreign Asiatics, chiefly Chinese. The aborigines resemble the Bataks of Sumatra. Most of them are Mohammedans; others follow pagan belief.

Bali and Lombok.—Separated by a shallow and narrow strait from Java, the island of Bali consists of a series of volcanic mountains and alluvial plains. Like other islands of the East Indies, it suffers from crustal disturbances. It was visited by a disastrous earthquake in 1917, and has witnessed violent volcanic activity. The loftiest volcano of the island (Agoong Volcano) became active in 1843. Thus Bali resembles Java in its physical structure. These islands are also comparable in their economic life.

Agriculture is the chief occupation of the inhabitants of Bali. The principal products of the island are rice, cacao, coffee, indigo, and cotton.

Physically and linguistically akin to the Javanese, the inhabitants of Bali are skilful agriculturists. Their chief religion is an ancient type of Brahmanism.

Bali forms one colony with Lombok, the population density of the united islands being approximately 380 per square mile of land. Like Bali, the island of Lombok is mountainous, and

volcanic in origin. It is traversed by two major mountain ranges. A fertile plain is located between these highlands. Rice, maize, coffee, tobacco, and cotton are produced on this plain as well as in various other parts of the island. The inhabitants of Lomok are known as "Sassaks."

Timor.—As the largest and most eastern of the Lesser Sunda Islands, Timor embraces an area of 12,450 square miles. It resembles the northern coastal region of Australia in climate, flora, and fauna. The coasts of the island are steep, difficult of access, and contain coral reefs. The inhabitants of the island are chiefly Melanesians living in various parts of the island, and Chinese in the coastal districts.

The Portuguese dominated over the whole island until 1613, when they were driven from the western part by the Dutch. At the present time the Portuguese occupy the eastern part; whereas the western region belongs to the Netherlands. The island as a whole reflects a low plane of economic development. Agriculture is poorly developed, the staple commodities being rice and maize.

Celebes.—Located to the east of Borneo and to the west of the Moluccas or Spice Islands, Celebes is one of the large islands of the Netherlands East Indies. The island has a very distinctive configuration. It consists of four long mountainous peninsulas which radiate outward to the east and south. These are separated by three deep gulfs. The island contains relatively little alluvial lowland, and the soils in general are not durable. Northern Celebes has a true equatorial climate, whereas the southern areas have the low latitude wet and dry type.

The agricultural industry is well developed in many parts of the island, yet there is ample room for further expansion. In the coastal districts the cultivation of the coconut palm has gained a secure foothold. Celebes handles not only its own trade but also that of small neighboring islands. Such goods are generally taken to the bazaars at Makasser, located on the southern peninsula of Celebes. The port of Makasser is engaged in the trade and exchange of a variety of goods; such as,

coconut products, bamboo-canes, rice, sandal-wood, coffee, pearls, and trepang.[13]

The Moluccas.—Located between Celebes and New Guinea, the Moluccas comprise a large number of small islands which cluster about larger island units, such as Halmaheira, Bieroe (Buru), and Ceram (Fig. 117). These islands, chiefly the southern ones of the group, were early sought for their spices, chiefly nutmeg, clove, and cardamom.

The inhabitants of the Moluccas consist chiefly of Malays, Melanesians of Papuan stock, a few remnants of the Mongolo-Caucasians, (forerunners of the Malays), and Chinese.

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[13] A sea-slug *(Holothuria edulis),* the dried flesh of which is especially esteemed by the Chinese.

CHAPTER XIX

The Philippine Islands

Importance of the Philippines.—These islands, ceded by Spain to the United States by the treaty of peace concluded between these nations on April 11, 1899, have ever since been a source of much debate with regard to their present and future political and economic importance. Military strategists point to the great strategic value of the Philippines to the United States in case of military operations in the Orient; whereas others suggest that they may be a liability in the event of war. Some economists believe that the Philippines are worth keeping as a market for our manufactured articles, whereas others reply that the buying power of the islands is relatively low. Some economists try to show that the United States would save many million dollars per annum by casting the Philippines adrift; others show quite as conclusively that we are many million dollars to the good as a result of retaining control of these islands. Yet our trade contacts have become increasingly more intricate and important. Trade records disclose the facts that the Filipinos were buying commodities from us at the rate of six dollars per capita in 1930 as compared with fifty cents per capita in 1903. Indeed, in 1930 the United States trade with the Philippines reached a total of more than $180,000,000.

These islands loom large not only as importers of American goods, but they are also an important source of agricultural commodities. Thus one of the four leading imports of the United States is sugar, a major plantation crop in the Philippines. Almost the entire exportable surplus of this crop is sent to the United States. Moreover, a long list of commodities, including Manila hemp, coconuts, tobacco, and tropical timber,

are being sent from these islands to the United States in increasing quantities.

Geographical location.—The Philippine Islands have a favorable situation for the production of tropical crops of various kinds. Here an oceanic climate and tropical location have combined to stimulate agricultural production to a high degree. Location southeast of continental Asia as well as in the northeast part of the Malay Archipelago is reflected in economic and cultural ideas typical of those areas; as manifested by the prevalence of religion and terrace agriculture characteristic of the Malays and the Chinese. Location with respect to middle latitude market areas, such as China and Japan, is reflected in a long-established trade relation with these countries; especially between the Philippines and China, which, indeed, may be traced back more than 400 years. Proximity to south China and favorable location with regard to world trade routes further favor the trade of the islands; especially Luzon, the northern island of the Philippines, which is located but 400 miles from the coast of China, and is therefore easily reached along the trade route via Suez or India to centers in the Far East—especially Hong Kong, Canton, Shanghai, and Yokohama.

Irregular configuration of the Philippines.—The Philippine archipelago comprises 7,083 islands and islets, of which only 466 have areas of more than one square mile each. The ten most important islands of this group are Luzon, Mindanao, Samar, Negros, Palawan, Panay, Mindoro, Leyte, Cebu, and Bohol, named in order of decreasing size. Only the first two of these cover more than 6,000 square miles apiece—Luzon with an area of 40,814 square miles or about as much as the state of Ohio, and Mindanao with 36,906 square miles.

It has been stated that the general outline of the Philippine archipelago is suggestive of a giant sloth with Luzon for the head and shoulders. The map of the islands further shows that they have an enormous length of coast line. Indeed, the total coast line of this group is approximately 11,511 miles in extent. This is due in part to the submergence of dissected islands—a

condition of the whole land mass comprising the archipelago.[1]

Influence of mountains and plains.—In these islands, mountains and plains interlock. The mountains are in part volcanic and in part the result of folding and faulting of rock strata (Fig. 118). From geological evidence it seems clear that

Fig 118.—View of Mayon Volcano, Philippine Islands. (Courtesy of Bureau of Science, Manila, P. I.)

there was a general buckling throughout the archipelago. Where fissures opened along the crest of the folds, vast quantities of extrusives poured out, concealing the underlying formations in many instances. But it is an error to think that all the rocks of the Philippines are igneous; since there is a wide distribution of the sedimentary series.[2] Under the influence of abundant tropical rains and high temperatures throughout the year, these mountains support extensive areas of forest. Since they are rugged and isolated, some of these mountain fast-

[1] Smith, W. D.: "Geological and Physiographic Influences in the Philippines," *Bulletin of the Geological Society of America,* Vol. 28, pp. 520, 521.

[2] *Ibid.,* p. 517.

nesses are the home of the least civilized people in the Philippines, such as the Negritos and Igorots.

The archipelago contains two main types of plain: coastal plain and intermontane plain. These plains constitute the

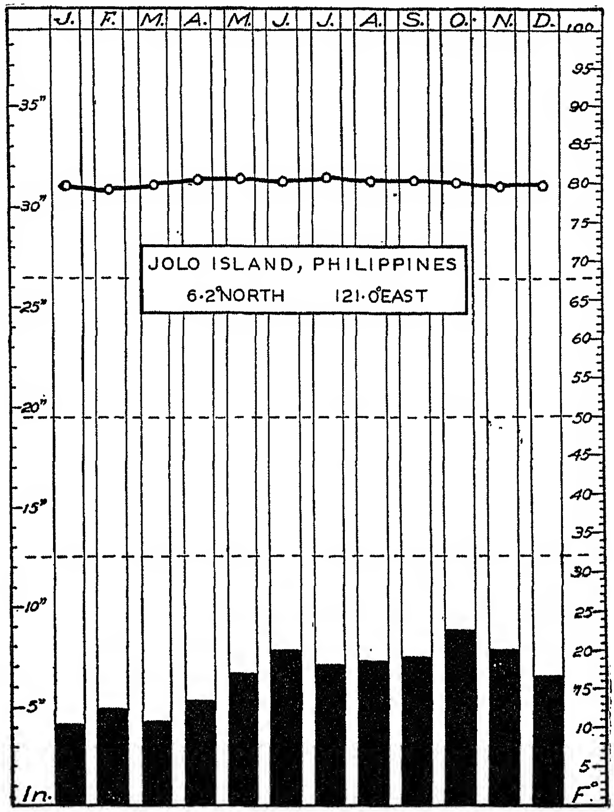

Fig. 119.—Temperature and precipitation during the year in Jolo Island of the Philippines.

home of the greater number of Filipinos, and they are the areas which produce most of the commercial products of the islands.

The coastal plains are relatively narrow, seldom being more than 10 miles wide. This is a consequence of the proximity of the mountains to the coast and to the relatively shallow continental shelf on which alluvial material could accumulate.

On the other hand, the intermontane plains are much wider than the coastal lowlands, although they have much the same origin and composition. Among such plains are the central plain of Luzon, the Cagayan Basin of northern Luzon, the

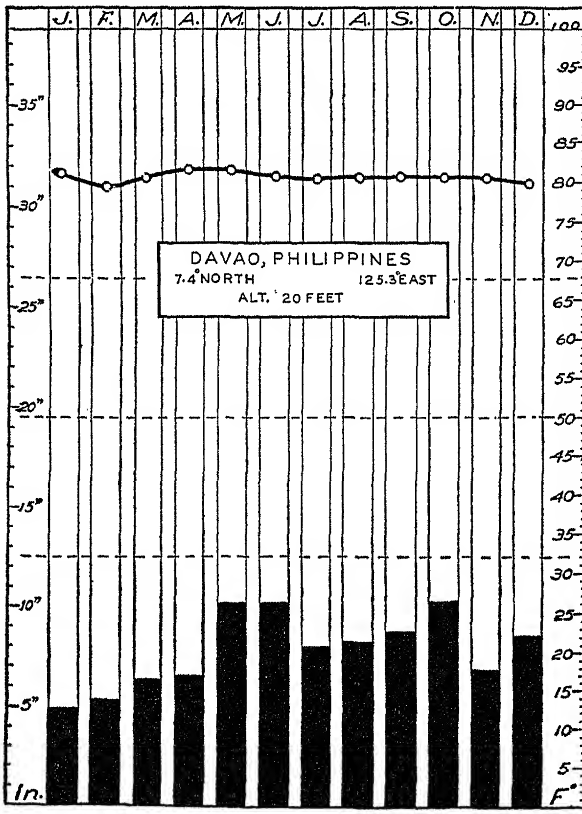

Fig. 120.—Temperature and precipitation during the year in Davao, P. I.

central plain of Panay, the Agusan Valley of eastern Mindanao, and the Cotabato Valley of southeastern Mindanao. With the exception of the Cagayan, these intermontane plains are broad and flat bottomed and they are the geographical base for the largest human agglomerations in the islands. On Cebu island is found an exception to this rule. There the greatest population densities are found on the coastal plain, the interior of the island being high, rugged, and sparsely populated.

Climate.—Located in the tropics and surrounded by warm waters, the Philippine Islands receive both high temperatures and an abundance of precipitation (Figs. 119 and 120). But the climate is not the same in all parts of the islands. Some

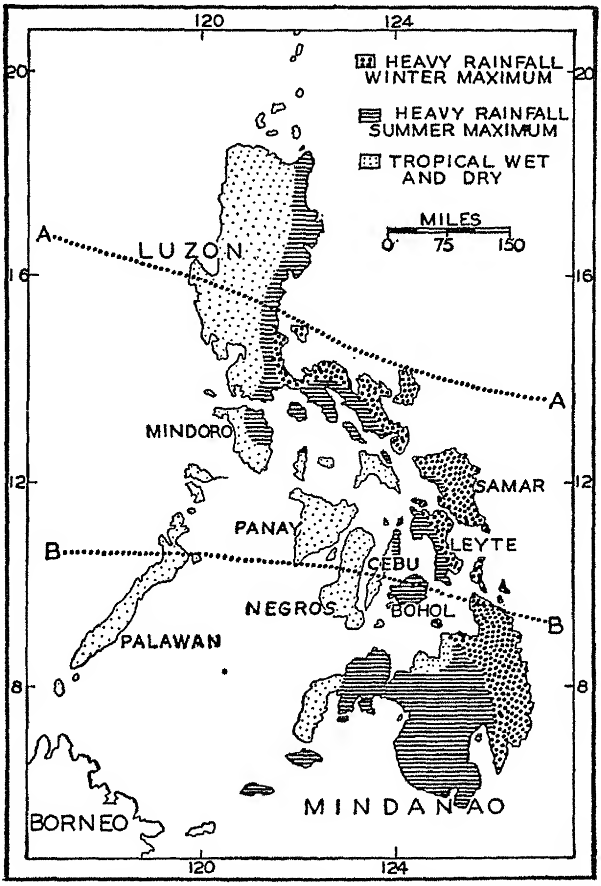

Fig. 121.—Climatic regions of the Philippines. The area south of line B-B is essentially free from typhoons; between B-B and A-A these destructive storms occur occasionally; north of A-A they occur frequently.

places have a summer maximum of rainfall, and relatively dry winters; others have no distinctive wet and dry periods.

The tropical (low latitude) wet and dry type of climate prevails in the western part of the archipelago. It reaches its maximum development in western Luzon, Negros, Palawan.

and the small western islands, which receive less than two inches of rainfall in winter and spring and 90 to 100 inches during the remaining seasons. Thus rain falls during the period of high temperatures, and the dry season affords favorable opportunities for harvesting the crops. Areas that have this type of climate generally grow a variety of crops, such as rice, sugar cane, tobacco, and corn.

In the eastern and southern parts of the archipelago there is no distinct dry season, and the climate is the rainy low latitude type (Fig. 121). Rain falls chiefly during the winter half-year, when the land is cool and the maximum amount of water is obtained from the passing winds, which lose much of their moisture on the eastern highlands of the Philippines. The hot surrounding seas and the many mountains cause the rainfall to be very heavy, and this area in general is the rainiest part of the archipelago, with precipitation of more than 100 inches a year.

These two types of climate—the tropical wet and dry and true equatorial—give way to transition types within the archipelago.

Typhoons.—The Philippine Islands are handicapped in being located in the track of a large number of typhoons during their most destructive stages.[3] This type of storm is similar in its meteorological characteristics to the hurricane of the West Indies, and like the hurricane it is usually destructive to both life and property.

Most typhoons originate over the waters east of the Philippines and travel either due west to the coasts of Indo-China, northeastward to the coast of China proper, or follow more or less closely the Kuro Siwo current to the Japanese Islands. In traveling westward many of these storms pass across the Philippines, especially the northern islands of the archipelago. These violent storms occur with greatest frequency from July to November, being almost entirely absent during the month of February.

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[3] Kendrew, W. G.: *The Climates of the Continents,* The Clarendon Press, Oxford, 1922, p. 146.

Geographical regions and land utilization.—Although the Philippines embrace a relatively small area of land, estimated at approximately 115,000 square miles, the natural environment varies within the archipelago. Thus the cultural and natural landscapes differ from place to place. There are coastal lowlands covered with alluvial soils washed from nearby mountain slopes—a coastal fringe that is well suited for the growth of the coconut palm and paddy rice (palay). Farther inland, intermontane valleys constitute a geographical base for the growth of a variety of commodities such as rice, sugar cane, corn, and tobacco. Defining the valleys are mountain slopes chiefly covered with forests and scattered patches of terraced land devoted to the production of rice. In the southern part of the archipelago high temperatures, abundant precipitation, and lesser frequency of the destructive typhoon combine to make the natural environment suitable for the production of abaca, the plant from which Manila hemp fiber is obtained.

Cultivated land.—By reason of the rugged land surface and many steep slopes, the Philippines contain a relatively small percentage of cultivated land. Indeed, only about 12 per cent of the total land area of the Philippines is under cultivation, which is even less than the percentage of land devoted to crops in the Japanese archipelago. This cultivated area of the Philippines is given chiefly to the production of rice, coconuts, corn, abaca, sugar cane, and tobacco, with rice occupying 49 per cent (1930) of all the cropped land. But the agricultural land may be extended considerably. It has been estimated that approximately 53.5 per cent of the total area of the Philippines is suitable for agriculture.

Forest land.—Approximately 63.5 per cent of the total land area of the island is in forests, which are most widely distributed on the mountain slopes and usually extend down these slopes to the areas devoted to grasslands and crops. The forests contain about 200,000,000,000 board feet of valuable timber—a large potential reserve of tropical woods.

With the increase in population and consequent utilization

of more land for crops, the forests will gradually decrease in size. With an ideal land utilization scheme in mind, students of Philippine geography and population problems have suggested the following: (1) area reserved for forest purposes 40 per cent; (2) area reserved for cultivation 53.5 per cent; and (3) area reserved for cities, towns, villages, roads, etc., 6.5 per cent.[4]

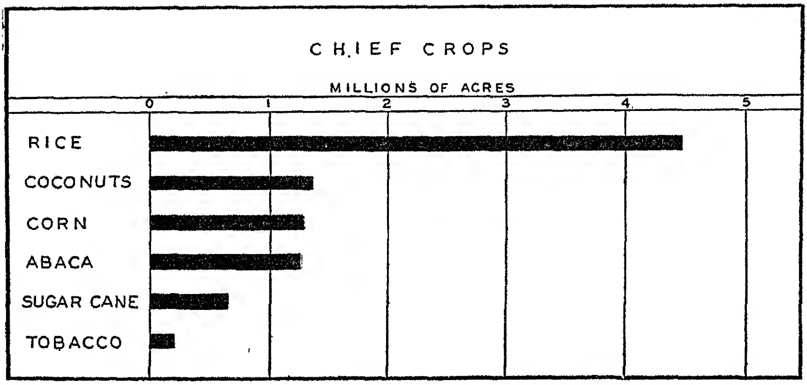

Fig. 122.—The major uses of the cultivated land of the Philippines in 1930. Note the importance of rice.

Importance of rice in the Philippines.—As the staple crop and staff of life of the Filipinos, rice leads in the production and acreage of all the crops grown in the archipelago.[5] In acreage it covers almost three and one-half times as much land as does the next most widely cultivated crop (coconuts), and in point of value surpasses even the important commercial crop, sugar cane (Fig. 122). Rice production is the big agricultural industry of the island and the population is dependent primarily upon this staple commodity. Under certain conditions, especially during the rainy season, the agricultural populations in some districts subsist only on rice and salt, and in certain places on rice and sugar. In the mountainous interior as well as in the intermontane and coastal valleys, rice is the

[4] Cruz, Cornelio C.: *Philippine Demography from the Geographic Point of View,* Institute of Pacific Relations, University of the Philippines Press, Manila, 1933, p. 14.

[5] *Ibid.,* p. 10.

mainstay of the population (Figs. 123 and 124). Any consideration of the future trend of the Philippine population must take into account the important role played by this crop.

Major rice-producing areas.—Rice is grown in most of the islands, but its chief area of production is the central plain of

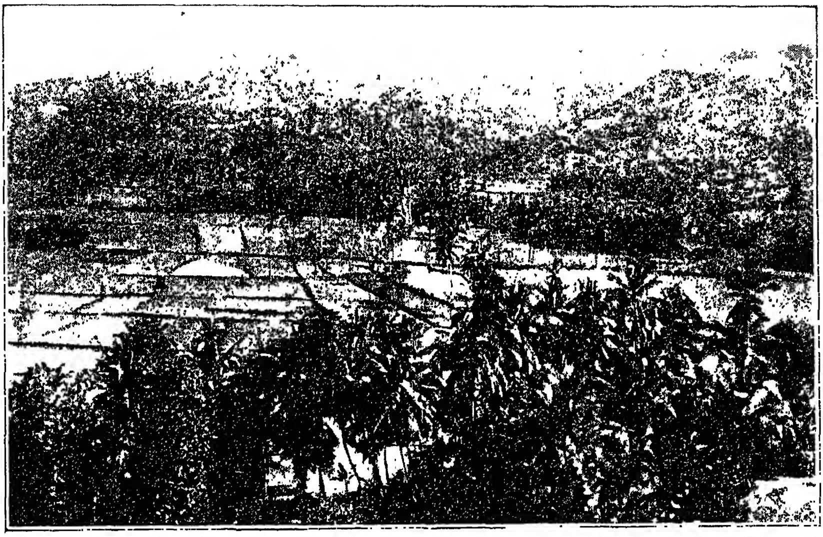

Fig. 123.—Areas of paddy rice. (U. S. Department of Agriculture.)

Luzon; and the highest yields per acre are obtained in the Candaba Swamp in the southern part of that area. Records disclose that approximately two-fifths of the home grown crop is cultivated in the central plain of Luzon, the lowland area in which Manila is located. Next in importance are the lowlands of Panay Island. Other important rice growing sections comprise the lowlands of northern Luzon. In these areas the production of rice takes place on small irrigated fields.

Rice production in the highlands.—In the interior highlands of the Philippines rice is grown in the intermontane valleys and in many places even on steep slopes. Rice terraces extend in the form of giant stairways or essentially contour cuttings of the mountain sides. The rocks used in the outer walls or dams to impound the earth and water are sometimes

brought from considerable distances. Even the earth back of the rocky walls in some districts represents material carried there by man. When one considers the tremendous length of these terraces and the fact that they are constructed entirely by man power with only the aid of primitive equipment, they

Fig. 124.—Lowland field showing a number of varieties of rice. (Courtesy Bureau of Science, Manila, P. I.)

become the more noteworthy. In general, the terraces are built on the windward slopes of the highlands, showing a close relationship areally to the districts that receive the maximum amount of precipitation. The benefit derived from such terracing is obvious, since both surface materials and water are retained to aid native agriculture in these districts of abundant precipitation and steep gradients.[6]

In some of the mountain fastnesses there appears a remarkable development of terrace agriculture by peoples who in most respects linger in a relatively low stage of civilization.

[6] Cruz, Cornelio C.: "The Mountain Province, A Geographic Study of Its Assets, Possibilities, and Handicaps," *Natural and Applied Science Bulletin*, Vol. 1, No. 4, University of the Philippines Press, Manila, pp. 343-378.

Thus the savage and semi-savage Igorots of the interior cordilleras of Luzon have constructed giant terraces with retaining walls measuring twenty to thirty feet in height. Here the production of rice for food is the all-important activity in which men, women, and even children are engaged.

Major handicaps.—Although the acreage is gradually expanding, much more rice could be grown. The natives frequently find it more profitable to raise other crops, especially such commercial staples as sugar cane, coconuts, tobacco, and abaca. In addition to this competition with other crops, some major handicaps may be recognized: (1) the general practice of growing but one crop of rice on the same land per year, although two crops may be produced in many localities; (2) the prevalence of inefficient irrigation systems; (3) the lack of a sufficient number of good farm animals; and (4) the large amount of public land suitable for rice cultivation that remains idle.[7]

Trends in production.—Recent trends in rice production in the Philippines indicate a marked improvement in yields per acre, and the production has more than doubled during the last 25 years. Associated with a gradual increase in acreage there has been a rather noteworthy increase in yield per unit area, which has been due mainly to the more extensive practice of irrigation agriculture during recent years. Thus the average yield increased from 431 pounds per acre for the period 1909-1913 to 1,097 pounds per acre in 1930.[8] Irrigated as compared with non-irrigated lands show yields of more than twice as much per acre. Yet there is considerable room for further development, especially as compared with the leading producers in the world, such as Japan, where the production is 2,644 pounds (1930) per acre. This greater production per unit area is explained in large measure on the

[7] Case, G. S.: "The Geographic Regions of the Philippine Islands," *The Journal of Geography,* Vol. XXVI (1927), p. 43.

[8] Cruz, Cornelio C.: *Philippine Demography from the Geographic Point of View,* Institute of Pacific Relations, University of the Philippines. Press, Manila, 1933, p. 18.

basis of more widespread utilization of fertilizers in the Japanese Islands.

In spite of an increasing rice production, the Philippines depend upon outside sources of supply to supplement their home grown rice. Yet this trade has shown a marked decline since the time of United States acquisition of the islands. Most of the imported rice comes from Saigon, French Indo-China.

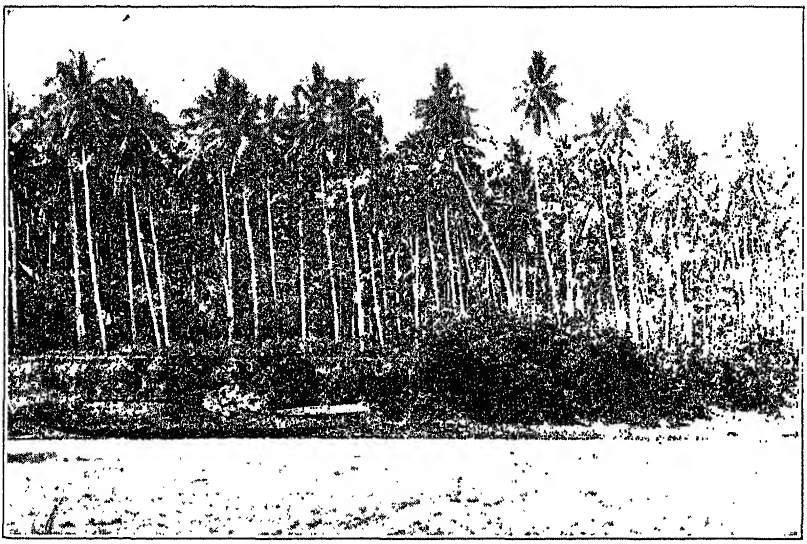

Fig. 125.—Coconut grove. (Courtesy Bureau of Science, Manila, P. I.)

Coconut production.—Second in acreage among the agricultural products of the Philippines, the coconut is important not only for the role that it plays in the export trade, but also for its many uses. Essentially every part of the coconut palm has some use. The leaves make thatch for roofs and shade for young tobacco and truck crops. Husks yield fiber (coir) for rugs and mats. The nutshells are converted into dippers, spoons, bowls, and cups. The roots yield a dyestuff, whereas the nuts yield drink, food, and oil. The trunks may be utilized for building material, and by tapping the flower stems of the plant the natives obtain a substance converted into wine and

vinegar. Commercially the coconut yields five distinctive products: copra, shredded coconut, coconut oil, coir fiber, and oil cake. Its oil is used in the manufacture of butter and lard substitutes, and in the making of soap.

The habitat of the coconut.—As has been stated, the coastline of the Philippines is extremely long owing to the broken, and highly irregular configuration of the archipelago. In fact, this coastal fringe has a greater length than that of continental United States. It is in this coastal area that the coconut reaches its maximum development, especially in the coastal lowlands of southern Luzon and in the coastal areas of the Visayan Islands and of Mindanao (Fig. 125). Here a combination of factors favors the growth of this valuable plant, among which may be mentioned an abundance of sunshine and moisture, and strong winds.

Trade in coconuts and coconut products.—The Philippine coconut trade is closely linked up with the foreign commerce of the United States in copra and coconut oil. This trade shows a phenomenal recent development. In fact, as recently as 1920 the Philippines supplied the United States with only seven per cent of its copra imports, whereas at present approximately three-fourths of the copra entering our country originates in the Philippines. Approximately two-thirds of the copra import is consigned to the chief Pacific coast ports—San Francisco, Los Angeles, Portland, and Seattle.

Of even greater value among the exports of the Philippines is coconut oil, which originally was handled almost exclusively in five-gallon cases, barrels, and drums. But a system has been perfected whereby the oil is shipped in tank steamers and deep tanks on passenger and cargo vessels operating between the Orient and the New World. For years the large ocean steamers had carried petroleum from the United States to the Orient and returned in ballast, whereas at present coconut oil is transported on the return voyage. Thus tank steamers are engaged in transporting petroleum from the Pacific coast ports to the Orient, and return with a

cargo of coconut oil in the same tanks. Such trade relations have favored the extraction of oil in the Philippines.

Trends in production.—A study of trends in coconut production discloses a gradual increase in acreage during recent years. Prior to 1927 the corn acreage was definitely larger than that of coconut palms, whereas a marked change has taken place since that date. One of the major reasons for this healthful status in the coconut business is the fact that in general the returns from coconuts are relatively stable as compared with the price fluctuations of many of the other leading agricultural commodities of the islands.

Sugar cane: a leading cash crop.—Sugar cane has been grown in the archipelago for a long period of time. Indeed, even Magellan reported its presence after his voyage around the world. At present this crop covers approximately 647,000 acres of land, ranking fifth in area among the crops of the islands. Yet in point of value it is second only to rice, and in the foreign trade surpasses all other single items of export.

The habitat of the cane.—Sugar cane reaches its best development in the western and northwestern parts of the islands, where the tropical wet and dry climate prevails. It is of little importance in the true equatorial southern and southeastern districts of the archipelago. In its distribution, therefore, we find the same condition in the Philippines as in Java, where the cane avoids the uniformly wet western areas and clings to the eastern and east-central districts. The low latitude wet and dry climate favors year-round plant growth. It has a sufficiently abundant rainfall as well as a dry harvest season. These climatic conditions have been capitalized to the greatest extent in Negros Island, the most important sugar-producing unit of the Philippines.

Sugar production.—For many years the sugar industry suffered severely from backward methods in the technique of sugar production, but conditions in this respect are improving gradually (Fig. 126). In 1916 more than 90 per cent of the Philippine sugar was exported in the form of muscovado, a crude product similar to the gur of India. At the present time

36 modern mills are producing more than 80 per cent of the total crop as standardized centrifugal sugar. Progress has also been made in selection of better grades of cane, thereby producing crops of higher sugar content. Planters are experimenting with the best of the Hawaiian and Javanese types of cane and are also developing some excellent varieties of their own.

Fig. 126.—Plowing and harrowing the field for planting sugar cane. (Courtesy Bureau of Science, Manila, P. I.)

Although the acreage devoted to sugar cane has increased but little during the last decade, the production of refined sugar has shown a steady upward trend, due mainly to the modernization of mills. The agricultural methods of the small farmers engaged in the production of cane are still very backward, and the average yields per acre in the Philippines are only one-third to one-fourth those obtained in Java and Hawaii. Further development in the Philippines awaits the[9] employment of greater and more adequate fertilization and the introduction of the proper cane varieties. Moreover,

[9] Fairchild, G. H.: "Philippine Sugar Yield," *Sugar News*, March, 1932, p. 158.

although the potential sugar cane acreage is much greater than the area now under cane, any considerable development would be handicapped by a scarcity of labor in many districts.[10]

Corn.—Among the subsistence crops grown in the Philippines, corn ranks next to rice. In acreage it is surpassed by rice and coconut palms. It is most widely cultivated in the Cagayan Valley of northern Luzon, and in the lowlands of Bohol, Cebu, and eastern Negros. It displaces rice in lowland areas where the soil has been developed from a parent material composed of coralline limestone. The year-round growing season is favorable to the production of corn on the well-drained lowlands. Planted during any period of the year, and cultivated with simple agricultural implements, some corn is harvested every month. Moreover, owing to its early maturity, two and sometimes three crops of corn may be produced on the same land in a given year.

Most of the corn remains at home, where it is used as feed for animals and as food for humans. Eaten as a porridge, it is frequently mixed with rice, and sometimes roasted on the cob.

Abaca.—Abaca is a crop of specialized production. Commercially it is surpassed by coconut products and sugar cane; in acreage, it ranks as the fourth most widely cultivated crop in the islands. It is the distinctive crop and the unique agricultural commodity, since its commercial production is essentially confined to the Philippines.

The plant is native to the Philippine Islands; either it has not thrived, or it has produced only an inferior grade of fiber when introduced into other countries. It has been tried in Hawaii, but with relatively little success. However, its recent introduction into Java gives promise of development in that area, which may some day become a serious competitor in the production of this fibrous plant. The Philippines enjoy the marked advantage of long-time experience in the production of the crop and the stripping of the fiber.

[10] Robertson, C. J.: "Geographical Trends in Sugar Production," *The Geographical Review*, Vol. XXII (1932), p. 124.

Resembling the banana plant and grown in humid tropical lowlands, the abaca stalks are generally from six to eight or more feet in length and contain fiber that is not only long but also has other favorable qualities (Fig. 127). Stronger, lighter,

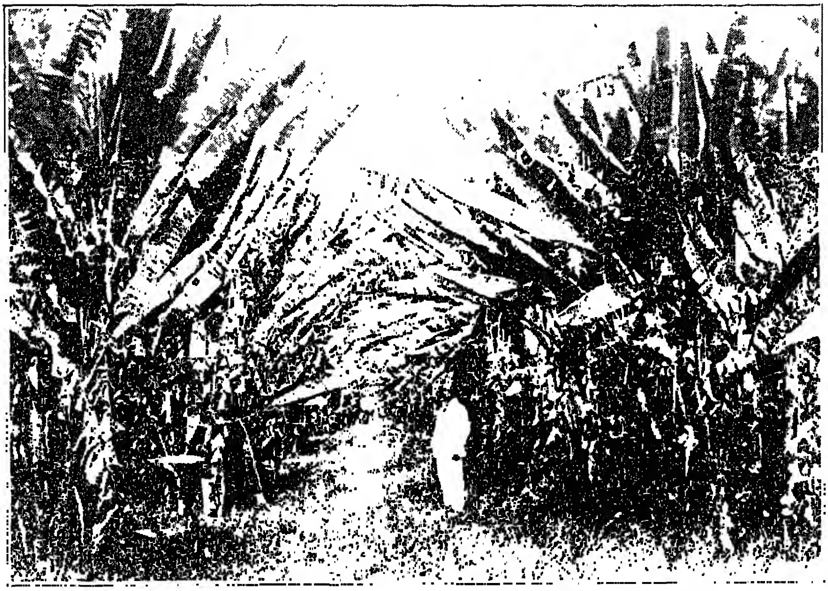

Fig. 127.—View of an abaca plantation in the southern part of the Philippines. (Courtesy U. S. Department of Agriculture.)

and more durable than any of the other hard fibers entering the manufacture of rope, it finds its best use where quality is a primary factor. It has long been used in the making of durable ropes designed for hoisting equipment and material on large engineering jobs, and for the rigging of ships.[11] The fiber is also used in the making of native slippers and hats, and competes with sisal in the manufacture of binder twine.

Produced on large plantations as well as on small patches of land, abaca is widely cultivated on the Pacific side of the Philippines from central Luzon to the southern part of Mindanao (Fig. 128). The latter is essentially free from the

[11] The property of withstanding constant wetting by sea water favors its use on ships, especially on sailing vessels.

destructive typhoon, whereas the central area is only visited occasionally. It is in the southern part of Mindanao that the Japanese are developing large abaca plantations.

The production of abaca fiber is unique in that the soil is

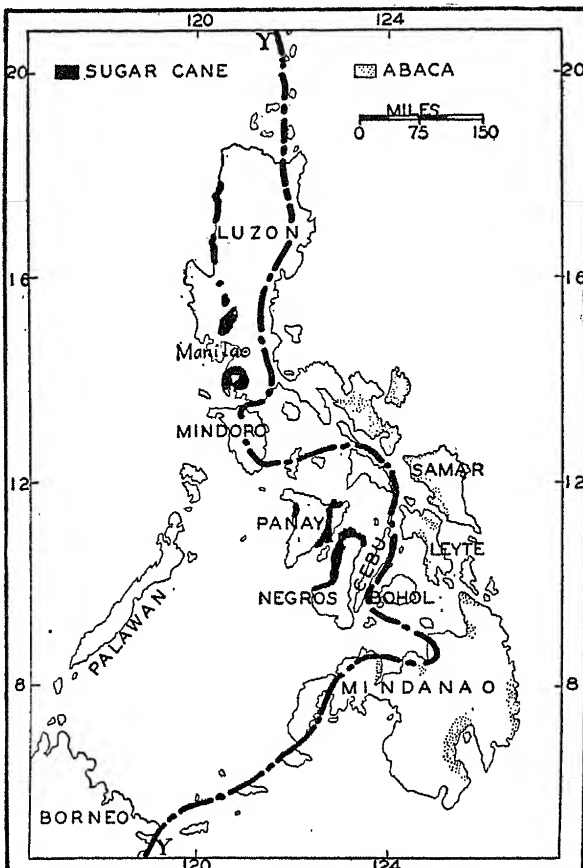

Fig. 128.—Chief districts producing sugar cane and abaca. The line Y-Y shows the divide on the basis of distribution of rainfall. West of this line there is a marked dry season; east of it, there is a more uniform, abundant rainfall.

made to produce the same crop for an indefinite period without either plowing or cultivating the land (except in one district). Fertilizing the land is not attempted beyond the addition to the soil of large quantities of abaca waste which is left to ferment in the fields after the harvest of the fiber. This

neglect is detrimental to the soil, to the plant, and to the fiber. The soil is exhausted of the necessary mineral plant foods and usually becomes acid; whereas the plant, lacking in essential mineral salts on which to depend for proper growth and development, becomes unable to resist disease. This is indicated by the low average yields per acre in the older abaca districts.

Fig. 129.—Hauling abaca fiber in the Philippines. (Courtesy U. S. Department of Agriculture.)

Abaca competes with other hard fibers, especially with sisal, in the making of cordage and binder twine (Fig. 129). During periods of relatively high prices for sisal, the Philippine product enters the United States markets in comparatively large quantities for use as twine. But the relative nearness of the sisal producing region of northern Yucatan, Mexico, gives that area a marked geographic advantage. In the production

of long, durable rope, however, Manila hemp is essentially unsurpassed, and competition is not a serious factor.

Tobacco.—First introduced into the Philippines by a group of Spanish missionaries, tobacco has grown in importance until it is sixth in acreage among the crops of the islands (200,000 acres in 1930). In 1781 the cultivation and sale of tobacco in some of the provinces of Luzon were declared a state monopoly. Production of tobacco increased considerably under the monopoly, and a large part of the government's income was derived from this source. With the abandonment of supervision under American occupation, many of the tobacco growers reverted to primitive methods in the production of the crop and allowed the quality of their product to deteriorate.

The greater part of the tobacco acreage is found in the Cagayan and Central Valleys of Luzon, and on the islands of Panay, Negros, and Cebu. Of these the narrow Cagayan Valley—2 to 14 miles wide and 160 miles long—is most important. Here location, climate, soil, relief, and labor conditions favor production. The Cagayan Valley possesses a fertile alluvial soil, renewed by the annual overflow of the Cagayan River. However, tobacco is not equally important in all parts of the valley. Thus the northern part—near the mouth of the river—is relatively less important than are the districts farther south (central parts of the valley), since the location of the northern area places it under the influence of sea breezes from which a certain amount of chlorine is absorbed by the young tobacco plants, thereby injuring their flavor, aroma, and burning qualities.

The agricultural outlook.—The present-day Philippine agricultural economy pivots mainly about the production of rice and maize for subsistence, and sugar cane, coconuts, abaca, and tobacco for the commercial world. The limited area of land given to crops is only in part due to the rugged relief of the islands; and extensive stretches of land await development and will be utilized as the population increases in density. In fact, estimates place the potential cultivated land at approxi-

mately 53.5 per cent of the total area of the islands. There is also considerable room for improvement in the agricultural methods or practices, which in general may be considered quite primitive. This fact is well illustrated in the case of rice, the mainstay of the agricultural population, which shows a yield per acre that is considerably less than half the yield per acre of the same crop in Japan. Larger yields can be realized with more scientific methods of cultivation, more widespread use of fertilizers, and better irrigation practices.

Approximately 98 per cent of the area under cultivation is owned by the Filipinos, whose farms, in harmony with the general status in the Orient, are very small—1.23 hectares (3 acres) being the size of the average holding. With the exception of a few Japanese hemp plantations in the region of the Gulf of Davao, there are but few foreign agricultural corporations on the islands.[12] In short, the land resources of the Philippines remain chiefly in the hands of the natives, a striking contrast with conditions in Porto Rico and Cuba, where they have passed in large part into the hands of American corporations. There is no reason to believe that this native small-scale agricultural industry will change materially in the near future.

The commercial crops, such as coconuts, sugar cane, abaca, and tobacco, have developed rapidly since American occupancy of the islands. Other commercial crops—rubber, cacao, sisal—have been introduced in recent years. Of these, rubber is noteworthy, but production is merely in the experimental stages, and is confined mainly to the valleys of the island of Mindanao. This is a true equatorial part of the islands. It is favored with adequate and properly distributed precipitation and compares favorably with the leading rubber producing regions of Malaya and the East Indies. This south island, moreover, possesses a marked advantage over the northern Philippines in being essentially free from the visitations of the destructive typhoon. At one time the Philippines appeared to have a fair opportunity to supply a large part of

[12] "Philippine Independence," *Senate Hearings*, Washington, D. C., 1924, p. 25.

the world's rubber, but British and Dutch interest and capital have taken advantage of the opportunities afforded in British Malaya, Java, and Sumatra, where densely populated Java and India have in large measure solved the labor situation. Any further development, not only of rubber but also of cacao and sisal plantations, must be financed by outside capital, since the average Filipino with his small agricultural holding, is in no position to await the rewards of long-term crops.

Timber and mineral resources.—The combination of rugged relief, abundant precipitation, and the relatively small percentage of cultivated land, suggests the widespread distribution of forests. The efficient utilization of highland areas demands that slopes with steep gradients, and which cannot be employed for crop production, should remain in forests. The forest, in fact, is the greatest asset of the interior highland region of the islands. Although the commercial and noncommercial forests cover approximately 63.5 per cent of the total area of the archipelago, the areas of virgin timber comprise not more than 40,000 square miles, or an area approximately equal to that of Ohio. Three-fourths of the trees in the virgin forests belong to the dipterocarp family, in which individual members of this family reach 200 feet or more in height. Many of these trees make valuable lumber; and some of them are unexcelled for cabinet work, interior finish, and other special uses.

Nowhere does the bamboo attain a more majestic state than it does in the forested districts of the Philippines. This plant is put to a great number of uses. It is used in the construction of chairs, beds, baskets, roofs, window shades, fans, vases, musical instruments, boats, and packing cases. White ants do not destroy the bamboo, and it is practically rat-proof. Moreover, it usually occupies uncultivated land.

Of the mineral resources, gold and silver have long been exploited. Traces of such exploitation may be found in many parts of the islands. Production is confined mainly to the mining districts of the Mountain Province and to the provin-

ces of Surigao, Ambos Camarines, and Tayabas. But the basic minerals—coal and iron ore—are worked but little. There is not sufficient coal on the islands to satisfy the demands of the manufacturing establishments, and both coal and petroleum are obtained mainly from foreign countries. Bituminous coal occurs north of Luzon on the small island of Batan, where it has proven useful for bunkerage purposes. Northern Luzon contains extensive deposits of copper ore, but utilization has been negligible, mainly because of the remoteness of the deposits and the poor transportation facilities. Further development of the mineral resources of the Philippines awaits the investment of capital for the construction of roads as well as the operation of mines.

Manufacturing in the Philippines.—Much of the manufacturing of the Philippines corresponds to our old home-system, and conditions in some districts are quite primitive. Everywhere the agricultural industry greatly overshadows the making of finished goods, and in general the raw materials of agriculture constitute the basic factor in the development of the large manufacturing enterprises. Factories have been rather slow in developing, although there are some engaged in rice milling, sugar milling, hemp stripping, copra drying, lumbering, and in the processing of vegetable oil and tobacco. In recent years, also, the distilling of liquors and alcohol has reached moderately large proportions.

Another occupation is the making of fine laces and embroideries, an art that was taught under Spanish regime, especially in the convents and religious institutions. Needlecraft, weaving, basketwork, are generally pursuits of the women and girls in most parts of the islands. Most of the white people of the Philippines, however, devote their time to large-scale industrial and commercial enterprises.

There are more than 800 rice mills in operation, most of which are small and require not more than two workmen each. The Chinese contract the rice trade of the island and operate the greater number of large plants, although some are owned by the natives. With a capital investment of more than

$100,000,000, the rice mills handle approximately 2,000,000 short tons of rough rice annually.

Primitive methods of manufacture are much in evidence. Thus in the large sugar industry of the islands, animal-power mills are found in many districts. Some of these mills have wooden rollers and are quite inferior to the large steam mills. The latter have become an important factor in the production of sugar in some of the western islands of the archipelago, especially the island of Negros. Here the mills are generally run by steam generated by burning the dried, pressed stalks of the cane.

The coconut industry further reflects the need of more modern practices. Indeed, investigators have shown that the low oil content of the Philippine copra is due mainly to the careless practices that prevail in the picking and drying processes, with the result that the product commands a relatively low price on the copra market.

In the making of hemp the Philippines enjoy the advantage of long experience. The stripping of hemp fiber is a well-known art and one in which Philippine labor has developed considerable proficiency. Following the stripping process, the abaca fiber is purchased by agents whose chief occupation consists of trade in this commodity, or the fiber is brought to the trading centers by the producers themselves. The fiber thus enters foreign trade; some of it goes to Manila and environs and a relatively minor quantity remains in the districts of abaca production, where it is made into small rope and abaca cloths. Even slippers and hats are made by the natives from this important fiber.

An industry of growing importance in the islands is that of sawmilling, and the average annual production could be materially increased without affecting the timber resources adversely.[13] Although more than fifty sawmills are already operating in the islands, only one-fourth of these may be regarded as comparable in size to the average modern sawmill

[13] The stand of timber is estimated at 192,000,000,000 board feet.

found in the United States. Most of the mills operate in small areas under a license system for a year's time. The large mills generally secure long-time licenses or concessions, as for a period of approximately 20 years, in which they may extract the timber from specified forested districts of the public lands. The great bulk of the Philippine timber output remains within the islands, where it is used for building purposes, in the mines, as well as for road and bridge construction work. There are also various Philippine timbers considered excellent for interior finish and fine cabinets, which enter the markets of Europe and the United States. Expansion of this industry will be associated with (1) population growth and the further clearing of forested land for agricultural purposes, (2) the introduction of valuable species into regions where reforestation may prove profitable,[14] and (3) the further development of water-power sites.

The power situation in the Philippines.—With an insufficient amount of coal and petroleum to satisfy her own needs, the Philippines are utilizing their water power resources to an ever increasing extent. The interior highlands possess the advantage in this factor, since they have the necessary prerequisites for the creation of water power; namely, high relief and consequent abrupt changes of levels of the surface waters (Fig. 130). But there are also great obstacles to be overcome before the water power factor will even remotely approach complete utilization, as indicated in the Mountain Province of Luzon. Among these obstacles may be mentioned: (1) the inaccessibility of power sites; (2) their distance from the major population centers; (3) the high cost of constructing roads to the power sites on account of the rugged topography of the region; and (4) the great fluctuations in stream

[14] The introduction of benguet pine, lumbang, balakat, ipil-ipil, eucalyptus, and molave has been suggested for many of the interior highland regions. Such trees will yield not only timber but important by-products, such as turpentine and oils.

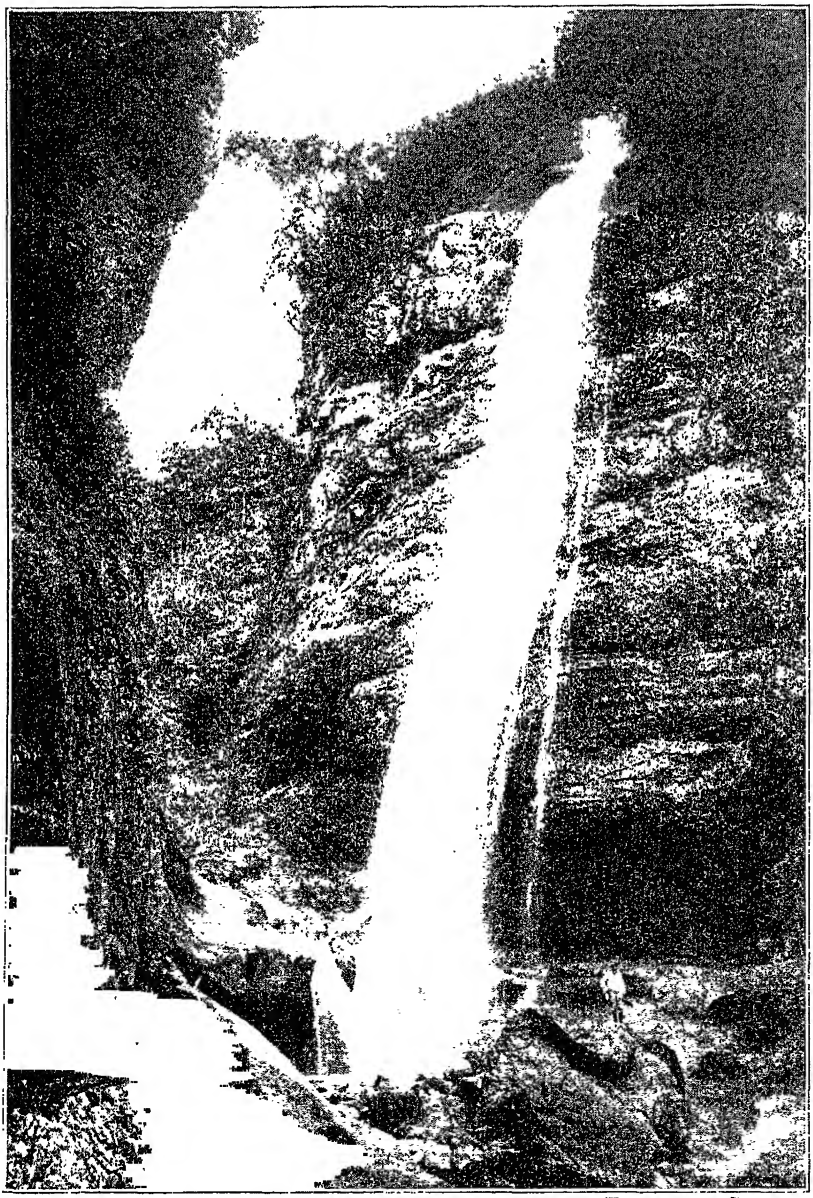

Fig. 130.—Fidelisan Fall, Bontoc, Mountain Province. (Bureau of Science, Manila, P. I.)

flow which have been caused in part by the lack of sufficient forest cover.[15]

Foreign commerce.—With the development of commercial crop production, the foreign trade of the Philippines has shown a marked increase under American rule. In fact, the increase in foreign trade since American occupancy is often

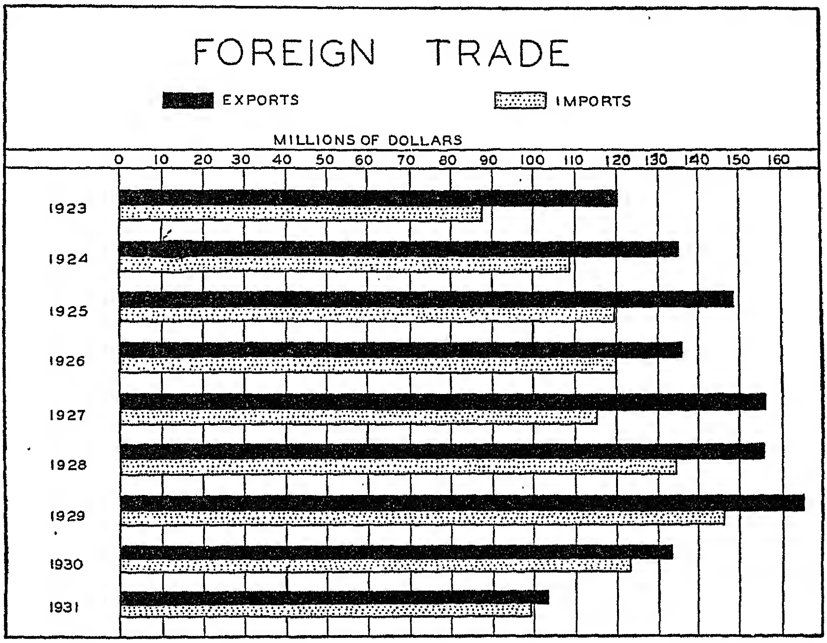

Fig. 131.—Exports and imports of the Philippines. The exports exceed the imports in value. This is a common characteristic of the trade of countries who are dependent upon foreign nations for banking, shipping, and many other services.

cited as one major indication of economic progress in the islands. Among the major features of this trade are: (1) the excess of exports over imports; (2) the predominance of agricultural products among the exports; (3) the importance of finished goods among the imports; and (4) the significance of the United States as a market for the exports and a source

[15] Cruz, Cornelio C.: "The Mountain Province, A Geographic Study of its Assets, Possibilities, and Handicaps," *Natural and Applied Science Bulletin*, Vol. I (Nov., 1931), p. 373.

of supply of manufactured goods. Exports have exceeded imports in value every year since the World War (Fig. 131). The trade balance is finally made by the invisible items of import—the banking, shipping, and colonial services rendered. Of the agricultural commodities exported, the most important are cane sugar, Manila hemp, coconut oil, copra, and tobacco

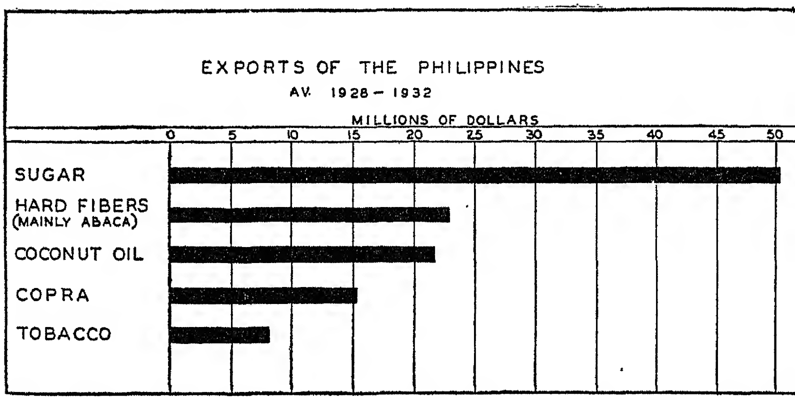

Fig. 132.—Leading merchandise exports of the Philippines.

(Fig. 132). Minor items exported include dessicated and shredded coconuts, lumber, hats, and maguey. The imports, on the other hand, consist mainly of cotton goods, iron and steel manufactures, meat and dairy products, wheat flour, automobiles and parts, and petroleum products (Fig. 133).

The channels or directions of Philippine foreign trade show the United States as the chief market for the exports and source of imported goods. In 1900 about 55 per cent of the islands' exports went to Europe, 26 per cent to Asia, and 13 per cent to the United States. At the present time, however, approximately three-fourths of the exports go to the United States. China's share in the Philippine trade has declined from 15 per cent in 1900 to less than 4 per cent at present. Such increase in the United States' share of the trade of the Philippines has been due in large part to the tariff system which has given them a privileged position in the distant American market and has prevented the islands from developing reciprocal trading privileges with their neighbors.

While many Americans and Filipino leaders support the present free-trade relation with the United States, there are others who feel that the tariff duties on non-American imports into the islands have been fixed to exploit the Filipino people for the benefit of American manufacturers.

The people and their economic status.—At one time (from 200 to 1325 A. D.) a dependency of various Hindu-Malayan

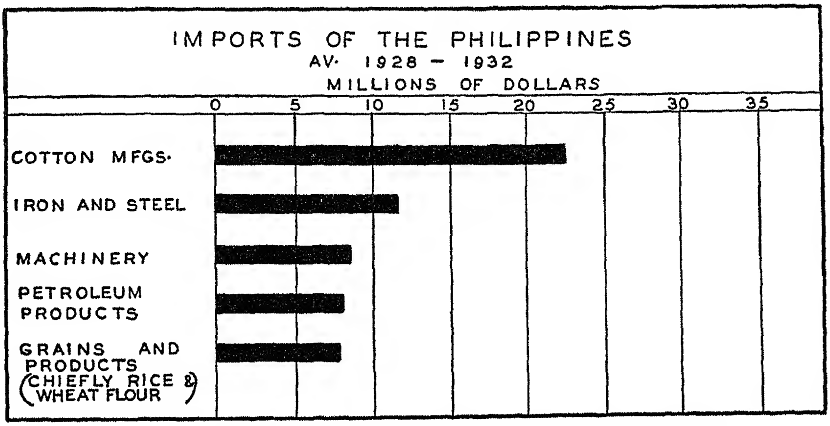

Fig. 133.—Leading merchandise imports of the Philippines.

empires, the Philippines are a member of the Malay-Polynesian family, and the Filipinos are related racially to the people of Java and Siam. Several centuries ago Malay immigrants entered the Philippines, displaced the aboriginal population, and became the predominant racial stock. At present, however, this stock is not absolutely uniform throughout the islands, since it is divided into 43 ethnic groups in which 87 different dialects are spoken. There are eight languages—each of which is spoken by at least half a million people—the most widespread of which is Tagalog, which is the mother tongue of almost two million of the inhabitants.

The largest foreign group in the Philippines is the Chinese. These people apparently entered the islands in greatest numbers prior to the time of American occupation, although it is reported that even at present Chinese enter the country illegally. As in other parts of southeastern Asia many of the

Chinese become merchants, and in the Philippines they control approximately three-fifths of the trade.

With their small agricultural holdings, the great masses of Filipinos lead a life of abject poverty. They do not have more than is necessary to supply their daily needs. Filipino leaders lay a large part of the blame upon the American failure to build up a suitable economic organization in the islands and upon the tariff regime. It is stated that the present tariff system gives the islands a privileged position in the distant American market and prevents the development of reciprocal trading privileges with their neighbors. The reluctance of foreign capital to enter the archipelago is a major obstacle to the development of a suitable economic organization. Outside capital receives but little encouragement under the restrictive land and corporation laws and the uncertain political status of the islands.

In 1933 the Committee on the Philippines, a joint undertaking by the Foreign Policy Association and the World Peace Foundation, recommended: (1) that the Philippines should be given a system of responsible government, to be subject to rights of intervention by an American Government General; (2) that the archipelago should have the right to be represented at international conferences; and (3) that this period of responsible government should terminate at the end of ten years in favor of independence of the islands.[16] In 1934, that is 36 years after Admiral Dewey destroyed the Spanish naval forces in Manila Bay, the Tydings-McDuffie Act, which provides for the independence of the Philippine Islands in about ten years, was accepted by the Philippine Legislature.

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[16] Foreign Policy Association and World Peace Foundation: "Recommendations regarding the Future of the Philippines," *Foreign Policy Committee Report*, No. 2 (Jan., 1934), New York.

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Part V
EASTERN ASIA

CHAPTER XX

Japan

Japan's rapid development and problems.—With a rapidity that is nothing short of astounding, Japan has developed from a little-known, secluded country to the dominant power in the Far East. In 1854 Commodore Perry of the United States Navy was instrumental in persuading the Japanese government to open its ports to international trade. With the opening of Japan's doors to world trade, transportation developed with remarkable rapidity. Then followed increasing specialization in agricultural production, the phenomenal growth of the country's population, acquisition of foreign territory, and the development of a modern manufacturing industry.

These developments have brought major problems. Within the last 80 years the population has more than doubled, and the food supply is a critical consideration of the Japanese. Rural dwellers are gravitating to the cities, where industry and commerce employ ever increasing numbers. Lacking the raw materials necessary for her industries, Japan is striving for assured access to these basic commodities—chiefly raw cotton, iron, fertilizers, and power resources. In addition, the country must have assured markets for her surplus economic goods. These and other problems greatly affect Japanese policy in the Far East.

Japan proper, the heart of the empire.—The Japanese Empire embraces a long chain of islands off the east coast of Asia, the large peninsula of Chosen (Korea), and the little peninsular unit of Kwantung. Stretching from central Sakhalin (Karafuto) in the north to Formosa in the south, the Japanese archipelago has a latitudinal extent of approximately

1,900 miles, and therefore contains various climatic and vegetative zones—tropical forests in the south and northern coniferous forests in the extreme north. Japan proper, however, consists of only the four large islands of Hokkaido (Yezo), Hondo (Honshu), Shikoku, and Kyushu, together with numerous islands lying between 30° and 40° N. latitude. These four islands embrace 147,655 square miles of land, or three and one-half times the size of Ohio. When the total area of other units of the Empire is added to that of Japan proper, the final figure is 260,379 square miles of land.

The Japanese, living mainly on small plains near the coast, and with the sea at their door, must attribute a large part of their development to favorable geographical location. The Japanese and British Isles are located on opposite sides of the large continental land mass, Eurasia; in fact, Japan is sometimes called the "Britain of the Orient." Both countries are located near enough to the mainland to receive the benefit from the advances in civilization that took place there, and both are limited in area; and therefore, like other small centers of civilization, developed rapidly under the influence of ready intercommunication and highly articulate and interactive life characteristic of confined areas. In the development of her civilization, "Japan borrowed freely from China and Korea, as Britain did from continental Europe, but these two island realms have brought Asiatic and European civilization to their highest stage of development."[1] Moreover, both countries contain large stretches of rugged land, both are groups of islands, and both are bathed by ocean currents.

But there are also striking contrasts between these island areas. Thus Britain lies in the path of the westerly winds and possesses a marine climate, whereas Japan is largely humid semi-tropical. Owing to this climatic difference, the agriculture of one is distinctly different from that of the other. Typical of Japanese crops are rice, tea, and the mulberry, whereas the British grow oats, wheat, barley, potatoes, and

[1] Semple, Ellen C.: "Influences of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal,* Vol. XL, p. 589.

flax. More than 25,000,000 sheep find pasture in the British Isles; less than ten thousand in Japan. The British have more than 30 per cent of cultivable land as compared with only

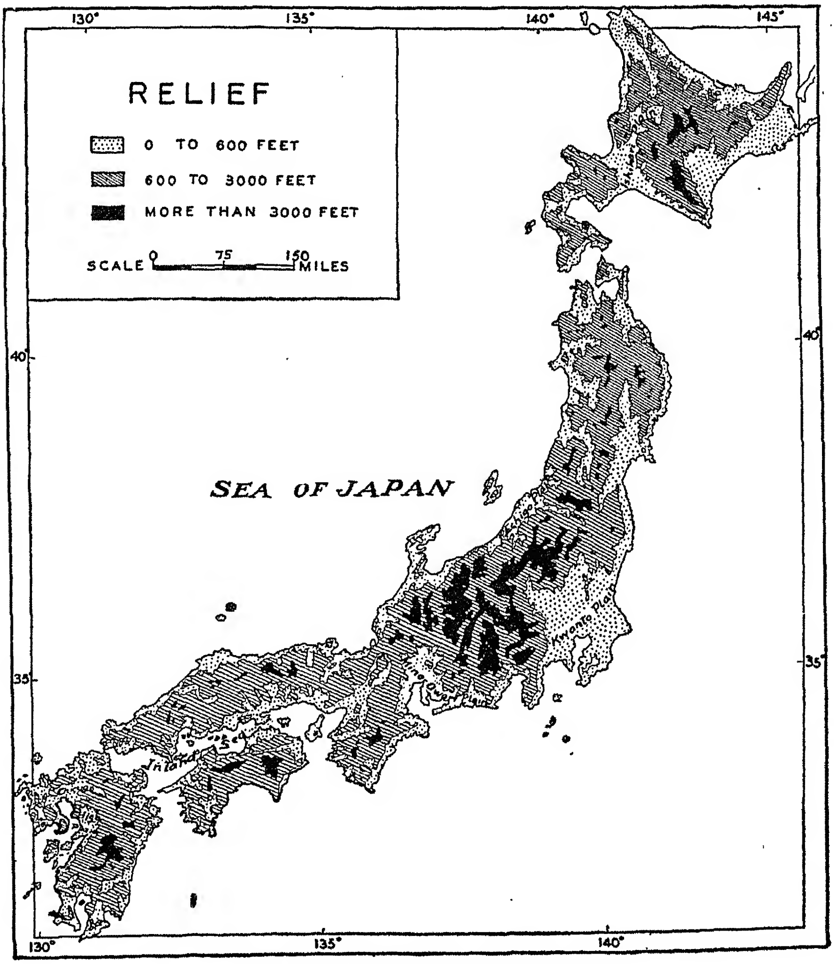

Fig. 134.—Relief of Japan proper.

one-half that percentage in Japan. Moreover, in Japan agriculture engages most of the people, whereas the major percentage of the British population is engaged in manufacturing and commerce.

The geographical significance of Japan's location is further reflected in the development of her international trade and in her growth as a maritime power. Since the opening of her doors to world trade, Japan has become one of the leaders in the commercial world. Such marked development in foreign commerce attests the favorable location of Japan for receiving as well as distributing goods. Its location near the world's largest human agglomerations has given her large markets for the sale of goods, though these are as yet not well developed because of the generally low purchasing power of Asiatic peoples. Location at the western extremity of an important ocean, the north Pacific, has been an added factor in the development of Japan's trade with the United States. The Japanese are, therefore, in a naturally defined area, surrounded by sea on all sides, and sufficiently isolated to give them the protection essential to national growth and economic development.

Physical framework of the country.—In the Japanese archipelago, mountains and valleys interlock. The backbone of the country consists of highlands broken in places by restricted alluvial valleys which terminate on their seaward end in relatively narrow coastal plains (Fig. 134). This highland mass is a part of the great Circum-Pacific Fold, which was caused by crustal disturbances within relatively recent geologic time. Subsequent faulting, together with volcanic disturbances, has further modified the land surface of Japan. In addition, the abundant precipitation and the long frost-free period facilitate erosion on a large scale, and aid the formation of numerous gullies, ravines, and valleys through which flow a complicated network of streams. Japan, therefore, is essentially a rugged highland mass, with approximately two-thirds of the land area distinctly mountainous in character. Such preponderance of highland with steep slopes and rock wastes sets definite and narrow limits to the cultivated area; yet the enterprising Japanese, under the spur of a rapidly increasing population, have advanced with their upland rice culture well into the mountain fastnesses.

The highlands in relation to crustal disturbances.—In being a part of the Circum-Pacific Fold, the Japanese islands are the seat of violent crustal disturbances. They contain a number of volcanoes, the most famous of which is Fujiyama (Fig. 135). Volcanic disturbances and seismic activity are common. One of the most destructive of these was the earthquake of 1923, which caused a tremendous loss of life and property in the area of Yokohama and Tokyo.

Plains limited in extent.—Owing to the mountainous character of the Japanese islands, the plains are of limited extent

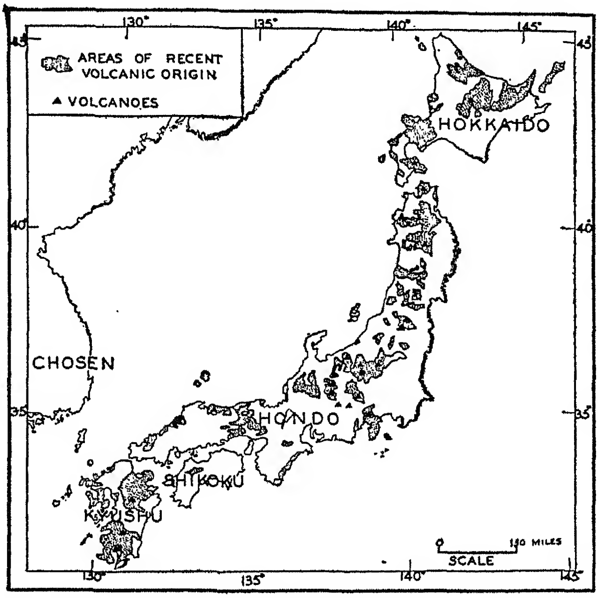

Fig. 135.—Areas of recent volcanic origin in Japan proper.

(Fig. 134). They are found in certain places along the coast as well as along the banks of the large rivers. The most important coastal plains are the Kwanto, the Mino-Owari, the Ishikari, and the Echigo. These in general constitute the most densely populated districts and contain the country's largest cities and most important cultivated lands (Figs. 136 and 137). Yet large tracts of the lowland hem of the country are rendered practically unfit for tillage because of the abun-

dance of coarse sediment deposited at times by the swollen mountain streams.

The Kwanto plain is the most important of Japan's low-

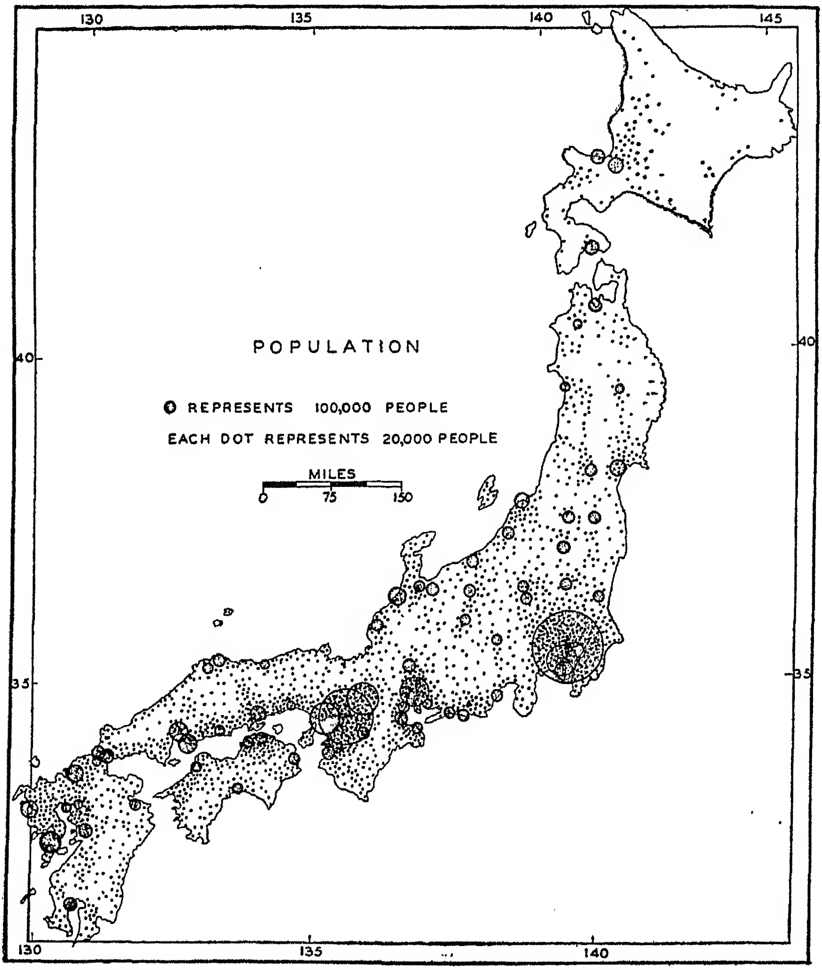

Fig. 136.—Note the great population densities in the coastal districts of Japan proper.

lands. This plain with its gently undulating, intensively cultivated surface is most densely populated. It contains more than eighty cities with populations of more than 10,000 people each. Among them is Tokyo, the capital of Japan, and

for many years the largest city. At a distance of approximately 20 miles from the capital one finds Yokohama, the most important terminus of the north Pacific Ocean route. Extending southwestward along the coast from the Kwanto plain is

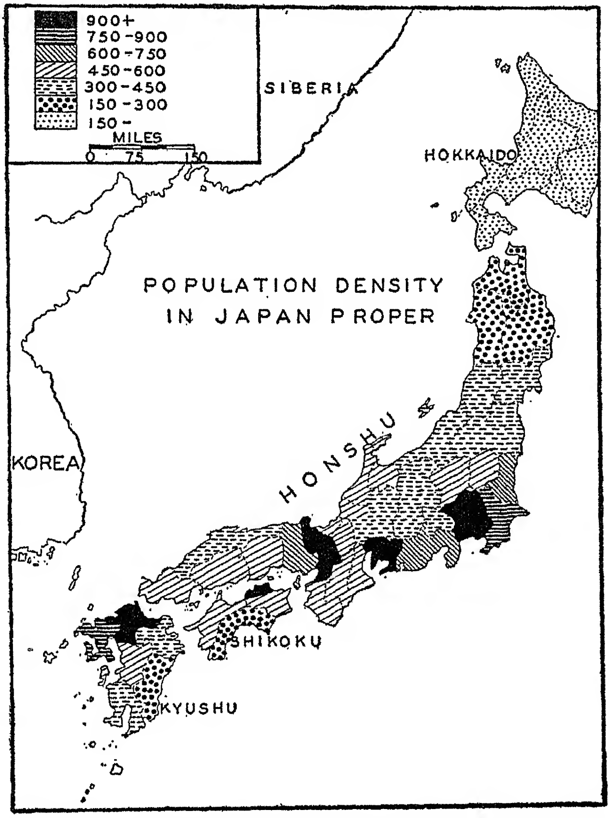

Fig. 137.—Population density in Japan proper by prefectures.

a narrow coastal lowland; and still farther to the west lies the Mino-Owari plain.

Stretching southward from the Hida Mountains, the lowlands of Mino and Owari constitute a part of the great depression whose southern half is at present occupied by the Ise-no-uni, an arm of the Pacific. Drained by the Kiso, Nagara, and Ibi rivers, the Mino-Owari lowlands produce rice of an excellent quality. Here manufacturing and commerce

are well developed. Nagoya, a flourishing industrial and commercial city noted especially for its porcelains, is located in this lowland region. On the west the region is flanked by a number of typical tilted mountains whose steep scarps face the Mino-Owari plain.

Climate of Japan proper.—The climate of Japan reflects the influence of a number of factors, among which may be noted: (1) the monsoon; (2) the latitudinal position; (3) the surrounding waters; and (4) ocean currents. The monsoonal air currents of Asia are basic to the seasonal variations in winds, precipitation, and temperatures, whereas the great latitudinal extent of Japan gives her a variety of climatic types. Thus the Japanese Empire stretches from the tropical wet and dry island of Formosa (Taiwan) to the northern coniferous forest type of climate characteristic of Sakhalin. Japan proper, however, is humid subtropical (Cotton Belt type), with the exception of northern Hondo and the island of Hokkaido, which have the modified humid continental type of climate (New England type).

Old Japan, therefore, has a climate similar to that of the Yangtze Valley of China, but, unlike the latter region, the precipitation and temperatures show a less striking seasonal fluctuation. Surrounded by semi-tropical seas, Japan proper, especially the west coast, receives a large amount of precipitation during winter as well as summer. The west-coast areas of Japan proper should show the greater seasonal extremes in temperature, by reason of direct position with respect to the monsoon of Asia. But the warm Kuro Siwo flows along this western coast and greatly modifies the temperature regime —a condition that is most noticeable in winter. In the northwest the snowfall is often heavy and traffic is intermittently interrupted all winter.

Precipitation as related to the monsoon.—The distribution of precipitation in Japan is largely under the control of the monsoons. During the months of summer, when low barometric pressures prevail over the continental land mass, the air currents moving inward bring warmth and rainfall to the

Japanese islands. Japan proper then receives its winds chiefly from the southeast; and the southeastern slopes of Hondo, Kyushu, and Shikoku have abundant rainfall, most of which is associated with the summer monsoons (Figs. 138 and 139). Here tea plantations flourish, such as those in Shizuoka Prefecture of southeastern Hondo.

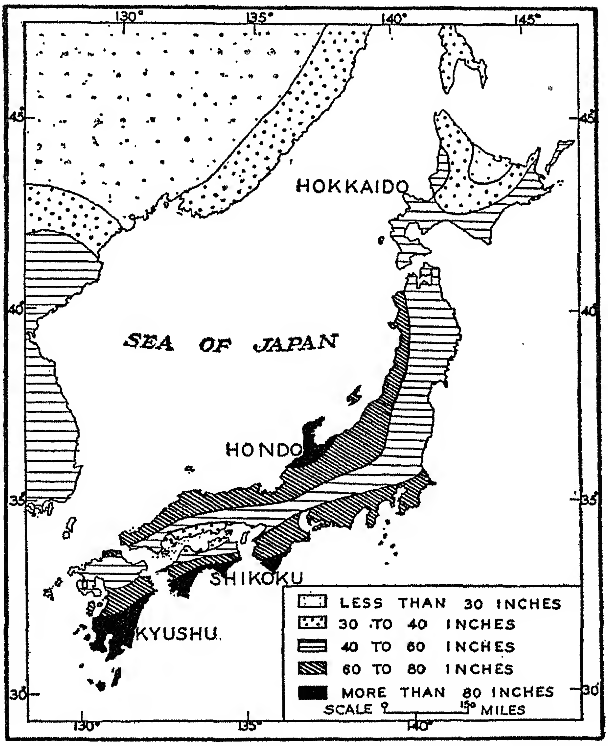

Fig. 138.—Distribution of precipitation in Japan proper. Note the abundant rainfall in the southeastern part of the islands.

In winter, on the other hand, when cold air accumulates as a vast blanket over continental Asia, winds blow mainly on the western side of the islands. The cold air from the continent blows over the Japan Sea, undercuts the warmer air stratum that surrounds this country, and forces it to rise along the slope of the land. Thus, gloomy weather with snowfall prevails on the side facing the Japan Sea, and rain showers occur almost every day in the Riukiu Islands. In the western

coastal districts of Japan proper, snow covers the ground and a thick veil of clouds overcasts the sky during the winter season. Fine days are phenomenal. In the prefectures of Niigata, Toyama, Ishikawa, and Fukui, chiefly in mountainous parts, heavy snowfall is experienced during the cold

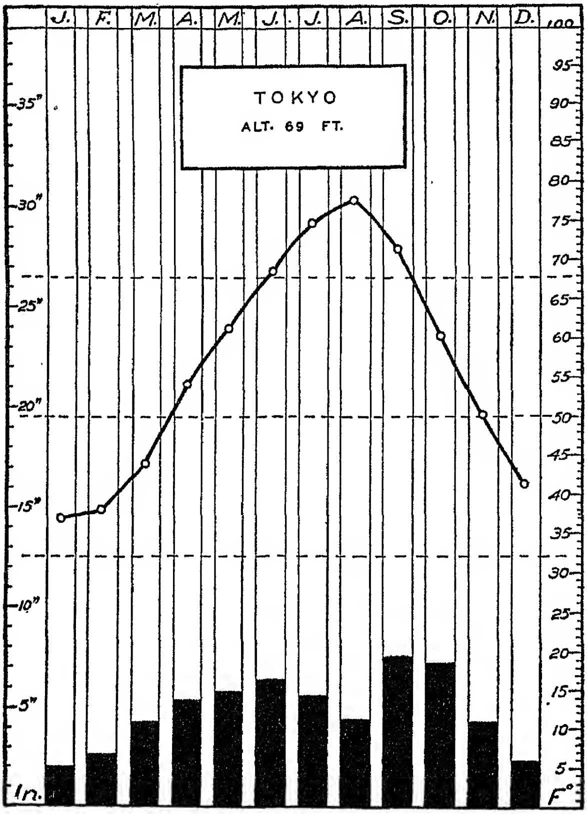

Fig. 139.—Average monthly temperature and rainfall in Tokyo, Japan.

months. In some districts the houses have prolonged eaves, the ground under them being the only thoroughfare for the people, since the snow sometimes covers the streets to the level of the second stories of the houses. In the valley of the River Ishikari in Hokkaido a snow layer of nine feet and even more occurs during some winters. Railway transportation is seriously handicapped, since the rails are often buried at great

depth under the snow. Although the snow is plowed by human and mechanical power, traffic is suspended for several days every winter. On the Pacific side, however, the climatic conditions are quite contrary to those experienced on the side

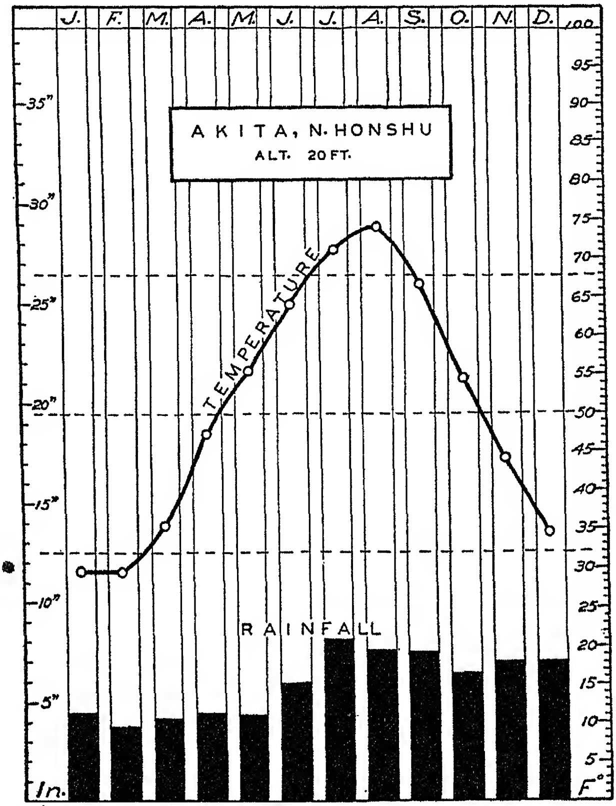

Fig. 140.—Mean monthly temperature and rainfall at a west coast city in northern Honshu. Note the abundant winter as well as summer precipitation.

facing the Japan Sea. Here fine weather prevails even during the cold months.[2]

Effect of ocean currents.—Two major currents affect the climate of Japan. One comes from the north, the other from the south. Flowing from tropical waters, the Kuro Siwo bifurcates in the southern islands of Japan proper. One branch

[2] *Scientific Japan,* Third Pan-Pacific Congress, Tokyo, 1926, p. 34.

of the current flows to the east of the islands, is deflected to the right and carried by the westerly winds across the Pacific, where it strikes the North American coast in the form of the Japanese current. The other branch clings to the western coast of the islands and is a major factor in modifying the climate in this part of the country; the winds coming from the continental mainland are warmed, their moisture-holding capacity is increased, and they expend much moisture in this region (Fig. 140). In fact, parts of western Japan have a winter maximum of precipitation.

From the north comes the Okhotsk current, which bifurcates in the northern islands. Like the branches of the Kuro Siwo, those of the cold northern current are deflected to the right of straight ahead. Thus the western branch flows toward the continental mainland of Asia, whereas the eastern branch hugs the east coast of the islands. So it is that semi-tropical agriculture extends farther northward along the western coast of Japan, as is indicated by the fact that tea grows farther north along the west coast than it does in the eastern part of the islands. The southeastern coast of the country benefits not only by the moderating influence of the Kuro Siwo, but also by the direct effect of the southeastern monsoon. Precipitation comes at the time of greatest heat and gives rise to flourishing plant growth. Here are the country's most intensively cultivated lands, including the well-known tea districts of Shizuoka Prefecture. In general, the combination of ocean currents and island location enables Japan to enjoy a much milder climate than the neighboring Asiatic mainland lying under the same parallels of latitude.[3]

Violent winds.—Devastating typhoons frequently visit Japan, especially the southern islands of the country. Similar in their meteorological characteristics to the hurricanes of the West Indies, the typhoons originate over the island-strewn tropical seas southeast of Asia. In fact, the typhoons originate

[3] For a detailed study of the climatic conditions in Japan see Okada, T.: "The Climate of Japan," *Bulletin of the Central Meteorological Observatory of Japan,* Vol. IV, 1931.

in those parts of the Pacific Ocean near the Caroline, Marshall, and Marianas Islands and move to the west, northwest, and north. Many of these violent rotary storms (about 50 per cent of them) enter south China or cross the Philippines, and the rest of them recurve on a parabolic course, following the Kuro Siwo to the islands of Japan and neighboring seas.[4]

Typhoons occur with greatest frequency during the latter part of summer and in the fall of the year. The months of August and September witness the major number of these violent atmospheric whirls, although the Riukiu islands are often visited by typhoons even in November. These storms frequently appear in rapid succession, one arising after the old one has passed. Thus some districts expect the visitation of a typhoon once a week or once every ten days.[5] Severe rainstorms commonly occur during the visitation of a typhoon, and a great deal of damage is always caused to houses, shops, and crops. When rainfall is abnormally abundant, rivers rise suddenly, overflow their banks, and cause inestimable destruction of property and at times considerable loss of life.

Soils and parent soil materials.—Three primary factors concerning the development of any soil are parent materials, climate, and native vegetation. In Japan may be found a variety of all three of these. Where the parent materials have remained in place, undisturbed by the elements of erosion, and only subjected to the processes of chemical and mechanical weathering, the mature soils tend to show strikingly the influence of climate and vegetation. But where torrential streams carry heavy loads of silt, sand, and gravel, which are deposited in the lowlands, and where volcanic ash has covered extensive areas of land in relatively recent geologic time, the climatic and vegetative factors have not had sufficient time to develop mature soil profiles in the mantle rock, and the parent material, therefore, becomes of utmost importance from the

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[4] Kendrew, W. G.: *The Climates of the Continents,* The Clarendon Press, Oxford, 1922, p. 146.

[5] Okada, T.: "The Climate of Japan," with a note on the Meteorological Service in Japan, *Scientific Japan,* Third Pan-Pacific Science Congress, Tokyo, 1926, p. 38.

standpoint of land utilization. Thus large tracts of land in the peripheral parts of the islands remain as useless rock wastes because of the detritus brought down by inundating mountain torrents, especially during the season of maximum rainfall. The heavy rainfall in most parts of the islands causes leaching of important mineral plant foods. In regions which experience very low temperatures during winter, mechanical weathering and leaching are checked, but such is not the condition in the greater part of Japan proper. Here leaching takes place the year round. Hence great care must be taken in maintaining the fertility of the soil.[6] It is generally believed that volcanic materials through the process of mechanical and chemical weathering form relatively fertile soils. But Japan has witnessed widespread ash rains from the Quaternary period to the present. In all of the chief mountainous parts of the country there is but little basalt or basic volcanic rock, which ordinarily weathers into fertile soils. On the other hand, one finds extensive areas that may be classified as ash and "outbursts of andesite." In general the volcanic soils fall into three groups: (1) ash, an undesirable ingredient from the standpoint of soils; (2) trachytes, which weather down into poor or mediocre soils; and (3) lavas and basalts, which have been the parent materials for some of the best soils in the islands.[7]

The best and most extensive rice lands of the islands are located on the silty alluvial soils of the river plains. The better-drained terraces and lower highland slopes, where coarse-textured materials have accumulated in great abundance, constitute important sites for the development of Japan's tea industry, especially in the southeastern part of old Japan.

The native vegetation.—With an abundant rainfall, varied relief features, and great latitudinal extent, Japan reflects a

[6] Semple, Ellen C.: "Influence of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal*, Vol. XL (1912), p. 590.

[7] *Ibid.*, pp. 591, 592.

luxuriant and diversified vegetation. In the north, Japanese Sakhalin contains vast forested areas of conifers, although much land is also under a park-like cover of vegetation. In boggy districts, one may see great numbers of hydrophytic species, and the sphagnum mosses are well represented. As in northern parts of North America and Europe, peat bogs have been formed by the remains of decayed plants in the lowland areas.

Farther southward, that is, in the northern part of Japan proper, the conifers become less widespread, and in Hokkaido the deciduous broad-leaved species are more numerous than the conifers. One of the noteworthy features of the native vegetation of Hokkaido is the inclusion of elements characteristic of much warmer regions—a natural consequence of its island position. The flora of northern Hondo shows a close relationship to that of Hokkaido, and contains comparatively many species belonging to much warmer regions. Yet, in general, the indigenous vegetative formations of northern Hondo may be classified as northern in character. The bamboo formations, for example, which are so characteristic of warmer areas, are quite rare. Southward from the middle part of Hondo, elements of warmer regions begin to predominate. Here deciduous and evergreen broad-leaved trees are found intermixed, the latter increasing in number with distance southward.[8] In southern Shikoku and Kyushu the flora consists entirely of elements characteristic of semi-tropical and a few even of tropical regions.

In Old Japan bamboo forests are widespread. Tall bamboo trees are found in the lowlands; whereas dwarf formations (*Arundinario chino* and *Sasa albomarginata*) are widely distributed in the mountains. This plant has many uses; as, for example, in the framework of the houses, for sails of junks, screens, paper, mats, pipes, and walking-sticks. But the indigenous bamboo grass which is widely distributed in the highland slopes of Old Japan is not only innutritious, but it

[8] Especially important among the evergreen broad-leaved trees are *Lithocarpus cuspidata, Quercus glanca,* and *Quercus myrsinaefolia.*

crowds out various important grazing crops.[9] Moreover, this grass is considered fatal to sheep, since the spicules it contains produce inflammation of the stomach.

In the southern part of the Empire, the island of Formosa comprises a tropical land in both climate as well as native vegetation. Its flora may be roughly divided into three sections, according to place of occurrence: (1) that of the coastal regions; (2) that of the plains regions; and (3) that of the mountainous areas. In the low muddy parts of the coastal districts mangrove is in profusion, whereas the better drained coastal lands contain a great variety of tropical types of vegetation. Indeed, it has been observed that the littoral flora of Formosa is richer than that of the whole coast of China.[10] The native vegetation of the plains regions is not so well represented as is that of the coastal districts, since the plains are largely under cultivation. In the uncultivated areas the native flora is very variable, and shows still greater variety when one approaches the mountain districts. Bamboo-groves are quite numerous. In the mountainous areas the vegetation is extremely variable, but may be classified into four distinct units, according to altitude: (1) the lower parts, where the evergreen broad-leaved trees predominate; (2) coniferous forests; (3) shrubs; and (4) grasses in the summit areas. Noteworthy among the highland trees are the beautiful arbors of camphor. This tree has become very important commercially, the camphor being extracted from the stem and roots, which are cut into small pieces.

Distinguishing characteristics of Japanese agriculture.—With approximately 48 per cent of her total population engaged in agriculture, Japan is essentially a nation of farmers, and agricultural pursuits are basic in the national economy. Even the important silk industry has its agricultural phase. However, manufacturing and commerce are attracting increas-

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[9] Semple, Ellen C.: "Influence of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal,* Vol. XL (1912), p. 595.

[10] Hagata, Bunzo: "General Aspects of the Flora of Japan," *Scientific Japan, Past and Present,* Third Pan-Pacific Science Congress, Tokyo, 1926, pp. 96-97.

ing numbers of people, and Japan holds a prominent position among the peoples of the Orient as an industrial nation. Much progress has been made in industry, whereas agriculture is still carried on much as it was during feudal times. Although specialized crops have been introduced into some districts where environmental conditions are favorable, and intensive methods of cultivation have resulted in increased yields per unit area, cultivation is still almost entirely by hand and the implements used are extremely simple and primitive.

A study of the agricultural situation of Japan discloses a number of salient features, of which the following are noteworthy: (1) the small percentage of cultivated land; (2) the small agricultural holdings; (3) the intensive character of Japanese agriculture; (4) the predominance of rice among the cultivated crops; (5) the paucity of livestock; and (6) the abundant yields per acre, but relatively small yields per capita.

The cultivated land.—With approximately 15,000,000 acres of arable land, Japan proper is handicapped in its agricultural development. This arable acreage comprises less than 16 per cent of the total land area (15.6 per cent), and when considered in proportion to population, gives on the average less than one-fourth acre per inhabitant. This small amount of cultivated land is due to a number of factors. A small island region with inelastic sea-drawn boundaries, Japan's area is narrowly limited and the country must apply industry and intelligence in order to supply her ever increasing demand for food. This small island-country is further limited in its cultivable area by reason of extensive regions of rugged relief, infertile soils, narrow coastal plains, and narrowly limited stretches of alluvial lowlands. One of the foremost national problems is that of finding more arable land for a rapidly increasing population. In Old Japan most of the lowlands and gentle slopes have been brought under cultivation, as indicated by the fact that approximately three-fourths of the land inclined at an angle of less than 15 degrees has already been reclaimed for agricultural use. Although the area reclaimed

since the beginning of the twentieth century for upland farms is matched by that reclaimed for paddy fields, it is largely to the vast stretches of uplands that Japan must look for its future expansion of a diversified agricultural economy.

Much interest has centered about the work of clearing wild land. Government bounty has been granted since 1919 for the reclamation of areas containing more than 5 cho (12.25 acres), the bounty being 6 per cent of the expenditure disbursed.[11]

The agricultural holdings.—Agriculture in Japan is on an extremely small scale, as is indicated by the fact that the average area per agricultural household is only 2.7 acres. Farms of more than 10 acres in extent constitute less than one per cent of the total. Moreover, since these figures include the relatively large individual holdings in Hokkaido, the majority of the farms in Old Japan are much smaller than the figure given above. Such miniature holdings attest the combination of small arable area, intensive culture, and dense population.

These small farms generally consist of a number of scattered fields or lots that are separated by boundary ridges. Much waste has resulted from this piecemeal subdivision of the land, especially where the separating ridges serve as footpaths. During recent years, however, scattered holdings have been combined into larger plots, thereby economizing the farmers' time, facilitating the use of animal labor in some districts, and reclaiming much needed land for purposes of crop production. The Japanese Government has offered special privileges (since 1900) as to tax, loans, etc., in order to lessen unproductive area in the shape of boundary ridges and to obviate the scattered existence of small plots of farms belonging to the same owners.

But these dwarf Japanese farms must compete with the much larger agricultural holdings in other parts of the world, and are further handicapped by the high land tax, which has resulted in large part from Japan's political policy in the Far

[11] *Japan Year Book,* Tokyo, 1930, p. 340.

East. A great love for their native land maintains a high spirit among the Japanese. The farmers as well as other workers of Japan are members of one great family, with the Sovereign at their head. Every one of the members is ready to give up his life for the family. Thus the Japanese farmers have been well described as simple, patient, and uncomplaining—"monuments of mute patriotism."

But the high tax on these dwarf holdings has caused a great drain on the Japanese farmers, who with their large families (5 to 6), have dropped in increasing numbers from the status of peasant proprietors to tenants. It is a significant fact that during the 19 year-period ending in 1923, the total cultivated area of freeholders increased only 9 per cent, whereas the rate for tenants showed a 19 per cent increase. In fact, at present more than 50 per cent of all of the rice land of Japan proper is worked by tenants.[12]

Intensive agriculture.—In no other land does the tiller of the soil receive the esteem that he does in Japan. Here his rank in the social scale is noteworthy. Indeed, even in overcrowded China with its agricultural millions, the farmers hold no higher place in the social scale. In both countries agriculture is intensive in character, and effective systems of tillage have been devised, although the farmers in most instances have had no scientific reasons for such development. Thus Japanese agriculture may be characterized as highly intensive in character though it is lacking in that scientific phase which marks the agricultural economy of various west European countries. Although the Japanese are handicapped by the natural infertility of soil in many districts, they obtain abundant yields per acre; as for example, the highest yields of rice per unit area of any major producer of that commodity. Such marked achievement has been rendered possible through the intensive application of labor. Careful cultivation, constant weeding, repeated applications of manure, painstaking watering of crops where irrigation is needed—these are suggestive of the intensive status of Japanese agriculture.

[12] *Ibid.*, p. 346.

The intensive agriculture of these small Japanese farms calls for a liberal use of fertilizers. In most countries these are supplied in large part in the form of animal manures. But in Japan the livestock industry is of little importance. Yet these people employ great skill in the choice and application of various fertilizing ingredients so that maximum returns will be realized from their agricultural pursuits. All animal wastes are collected and carefully applied to the soil at the proper time; and in this country, with its densely populated districts, night soil or human waste is conserved with the utmost economy. In addition, the Japanese use fish guano and the refuse of their abundant fish diet together with wood ashes, oil cakes, green manure, composts, sulphate of ammonia, superphosphates, and many other kinds of fertilizing materials. Estimates have been made to disclose the value of the various major kinds of fertilizers employed in agriculture. These estimates indicate that the total value of the various domestic manures exceeds that of commercial fertilizers. From the rough calculations made by the prefectural offices, it is judged that self-supplied manures are valued at approximately $160,000,000 per annum, whereas the commercial fertilizers reach approximately $110,000,000 a year.[13]

Fertilizers are applied with great care, and although the Japanese may be ignorant of the scientific reasons, they have the knowledge accumulated through century-long experience of the practices which result in maximum crop returns. Fertilizer is applied to all crops, even on freshly broken or virgin soil. It is applied to each individual plant of a given crop, with the exception of rice. Most of it is placed in the ground with the seed, whereas the remainder is applied to the growing plants. Economy and effectiveness are sought through this practice. Manure is never applied directly to a fallow field, since it would result in great loss of the fertilizing elements

[13] The self-supplied manures consist mainly of composts ($60,000,000), green manure ($20,000,000), night soil ($45,000,000), and miscellaneous kinds ($35,000,000). The commercial fertilizers are obtained mainly from Manchuria, since bean oil constitutes approximately 50 per cent of the total.

during the periods of heavy rainfall.[14] By reason of the humid subtropical climate, decomposition and deoxidation of organic matter is rapid, and the copious rains carry the fertilizing ingredients to depths beyond the roots of the growing plants. Thus the Japanese employ the system of frequent fertilization of individual plants in order that the loss of fertilizers may be reduced to a minimum. With his long-handled dipper, the Japanese farmer pours the weak liquid manure on each separate plant.[15]

Crops and cropping systems.—In the Japanese agricultural system, many crops may be found, and these are grown singly as well as by various methods of intertillage. It should be further emphasized that the crops are grown mainly as food for immediate consumption by the Japanese people rather than as feed for livestock. The obvious substitute for meat is found in the great quantities of fish caught annually in the off-shore waters and in the pulses which form an important part of the Japanese food supply. In fact, the combination of fish and rice in the coastal areas is believed by some to account for the precocious development of population in those districts.[16] Cereals, vegetables, and fruits are consumed everywhere, and the Japanese are essentially vegetarians, except for the abundance of fish food which is part of the national diet. Rice and other cereals normally constitute more than 50 per cent of the total value of the entire agricultural production. It has been shown that 1,000 bushels of grain contain several times (5 times) as much food value as the meat or milk that can be produced from it.

An enumeration of the crops grown in Japan indicates a great variety. Yet the mere listing of them gives no adequate picture of the agricultural development and the status of land utilization in Japan. It is thus significant to note the conspicuous place held by the cereals, especially rice, which

[14] Semple, Ellen C.: "Influences of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal*, Vol. XL (1912), p. 596.

[15] *Ibid.*

[16] La Blache, Vidal de: *Principles of Human Geography*, Henry Holt and Co., New York, 1926.

occupies approximately 50 per cent of the total cultivated land. It is the key crop in Japanese agriculture and the staple commodity of the Japanese population. Next in acreage to rice are various grains, such as barley, wheat, oats, and millets. Pulses, the mulberry, tea, and tobacco further add to the farming industry as a producer of wealth.

The intensive agricultural system of the Japanese is nicely reflected in their practice of multiple cropping, which may be compared to market gardening on a scale of great magnitude. By planting crops in hills and rows with intertillage, the agriculturists commonly have three or more crops growing upon the same field at the same time, but in different stages of maturity. Although the crop combinations may vary, they usually include a legume and a cereal, which in many highland districts are set out in the spaces between mulberry trees. In the uplands one may frequently find a multiple cropping system in which mulberry saplings are set out in alternate rows with various vegetables and maize. The pulses are often grown in alternate rows with millet, maize, carrots, and daikon (giant radish).[17]

Although multiple cropping appears to take place on all upland or dry farms, it is not lacking in the agricultural economy of the lowlands, even though rice assumes a relatively more prominent place in these areas of favorable relief. Thus in the plains of southeastern Hondo various crops are varied with rice, the principal one, such as, rice and barley, rice and rape. In some districts where cotton is grown, it may be found together with barley, the latter acting as a protection for the growing cotton crop. The harvest of the barley is performed in such a way that the straw remains standing in order to protect the cotton plants.

The rice crop.—Third in the world as a producer of rice, Japan also imports large amounts of this commodity every year.[18] It is the great staple consumed by the country's

[17] Semple, Ellen Churchill: "Influences of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal,* Vol. XL (1912), p. 599.

[18] 397,000,000 pounds in 1930, 277,000,000 pounds in 1931, and 337,000,000 pounds in 1932.

millions of people (Fig. 141). It has functioned as a gravitative force in keeping Japanese in areas where this commodity can be grown. In fact, one of the major factors which has kept great numbers of Japanese from settling in Hokkaido is the fact that the island is not a suitable land for rice production, except in some of the southern districts. In general, rice is consumed for breakfast, for lunch, and for dinner. Although other types of food are also consumed, especially fish and bean preparations (tofu and miso), these are designed to supplement rather than take the place of rice at any given time. Even between meals, rice cakes constitute an important foodstuff.

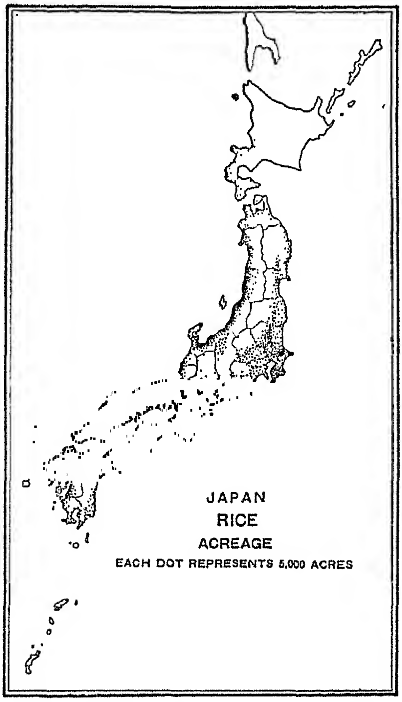

Fig. 141.—The rice acreage of Japan. (U. S. Department of Agriculture.)

Just as the country's cultivated land falls into two major classifications, wet fields and upland farms (ha and hata or hatake in the native tongue), so the rice may be considered chiefly as upland rice and paddy, although some 4,000 varieties of rice are known to exist in Japan. Approximately 51 per cent (7.9 per cent of gross area) of the total cultivated area in Japan is classified as paddy land. Since a part of the total paddy acreage of the country is given to winter crops, rice should not be considered the only commodity produced on these lowlands. Moreover, in bad years, when the rice-planting season has passed, millets are sometimes substituted on paddy fields.[10]

[10] Semple, Ellen C.: *op. cit.*, p. 598.

Yet the rice crop more than equals the combined value of all other crops.[20]

Although rice culture has crept up the highland slopes and cultivation takes place in some districts only by reason of a tremendous expenditure of human effort, the rice lands par excellence are the paddy fields of the country, especially the peripheral districts, or seaward fringes of the archipelago, where the coastal plains and delta fans constitute the geographical base for this important crop. To those areas Japanese agricultural and industrial life has gravitated, and rice culture reflects a complete and intensive cultivation that has been facilitated by reason of slight relief, ease of irrigating the land, and somewhat more fertile soils than one may find in many of the highland districts.

The cultural landscape of the paddy fields during the period of rice growth reflects a multitude of extremely small, irregularly-shaped fields, covering only approximately one-eight of an acre in size, each field being enclosed by tiny dikes less than fifteen inches in height and width. But this otherwise essentially monotonous cultural landscape is generally broken by elevated roads, valleys, intersecting irrigation and drainage canals, and in some places by elevated dry fields devoted to unirrigated crops.[21]

The cultural landscape differs not only from place to place, but also from time to time. Paddy rice makes its first appearance in this cultural setting in April, and during the following month these nursery seed beds stand out as bright green patches amidst extensive stretches of fallow. In this planting of the nursery beds the rice is scattered directly upon the surface of the well-worked ground and then pushed into the soil.

Prior to the transplanting of rice, and while it is still growing in the seed beds, the Japanese are busy plowing,

[20] Trewartha, Glenn T.: "A Geographic Study in Shizuoka Prefecture, Japan," *Annals of the Association of American Geographers,* Vol. XVIII (1928), pp. 216 and 217.

[21] *Ibid.,* p. 217.

leveling, and working the ground for which this crop is designed into the consistency of mortar. In fact, there is a thorough puddling of the soil, thereby permitting perfect contact for the roots; and irrigating waters are kept off the land until the crop is transplanted. Miniature fields are formed by low, narrow, raised rims or dikes. Growing in the nursery beds to a height of eight or ten inches, the rice is transplanted in June, and the cultural landscape takes on another expression. The fields swarm with human beings, the women being engaged in pulling, rinsing, and tying the rice plants, and the men in transplanting the crop. In August the green of the rice fields is the prevailing color in the landscape. With the ripening of the grain in late October and in November, the landscape reflects still another scene—this time multitudes of people engaged in the harvesting of grain in fields which now have essentially a yellow appearance. The result of this harvest is the highest average yield per acre among major world producers of this commodity.

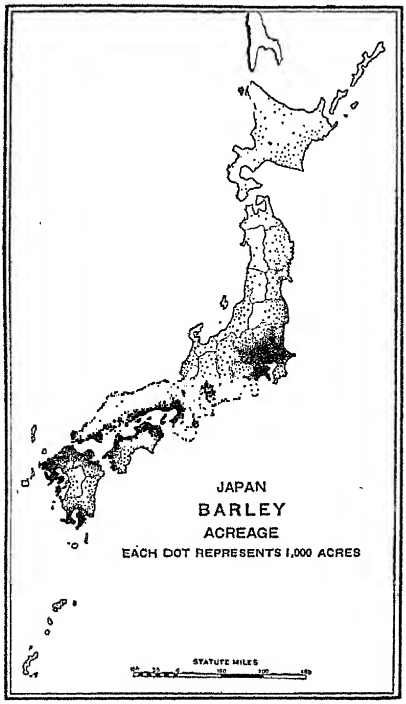

Fig. 142.—The barley acreage of Japan proper. (U. S. Department of Agriculture.)

During winter a part of the paddy area of Japan remains fallow, whereas the remainder is given to certain winter crops.[22] In some districts the winter crop consists of a legume which is plowed under as green manure, but in many districts the low paddy lands are ridged—a practice that is essential,

[22] Approximately 7 per cent of the paddy area of Shizuoka, southeastern Hondo, remains fallow during winter. *Ibid.*, p. 219.

since the winter precipitation of Japan keeps the paddy fields in a very wet condition. Approximately two-fifths of the country's wheat and three-fifths of its naked barley are grown on paddy fields, mainly during the winter season (Fig. 142).[23]

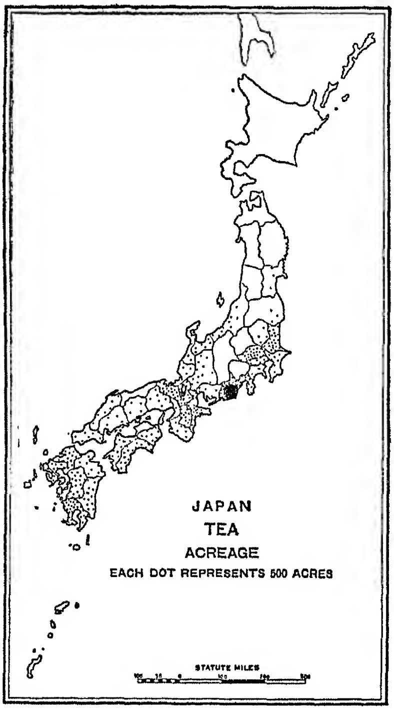

Fig. 143.—The tea acreage of Japan. (U. S. Department of Agriculture.)

Upland rice finds a place on many of the farms in the highlands of Japan. During summer it is grown together with vegetables, millets, and maize. Since it needs but little water and can do without irrigation, upland rice is confined to the mountains and to the northern rim of the swamp—rice area.[24] Although it yields relatively smaller returns per acre than paddy rice, probably because of careless tillage, it has potentialities; and where carefully cared for, the returns are considerable.

The tea crop.—Native to the hill lands and mountains of monsoonal Asia, the tea plant finds in the environmental setting of Japan favorable conditions for growth and commercial significance. Surpassed in tea acreage by China, India, Ceylon, and the Dutch East Indies, Japan proper ranks fifth in the world as a producer and exporter of this commodity.[25] Tea is grown on small patches of land, covering usually only one-quarter of an acre apiece. Unlike the tea industry of Assam and Ceylon, that of Japan is confined to small holdings rather than large estates.

[23] *The Japan Year Book,* Tokyo, 1930, pp. 340, 341.

[24] Semple, Ellen C.: *op. cit.,* p. 597.

[25] Trewartha, Glenn T.: "The Tea Crop," *The Journal of Geography,* Vol. XXVIII (1929), pp. 3 and 4.

In Japan proper the tea acreage shows an extremely irregular distribution, with areas of maximum concentration of production in the southern and southeastern parts of the archipelago (Fig. 143). The northern part of Honshu and the island of Hokkaido have climates that are unfavorable for profitable cultivation of this crop. The tea region par excellence is Shizuoka Prefecture, where approximately half of the nation's tea crop is produced. This greater concentration of tea production on the Pacific side of Japan as compared with the opposite coastal districts (Japan Sea side) is due to a combination of factors, such as more sunshine, less snowfall, a heavier rainfall, longer growing season, and somewhat less severe winter temperatures than one may find in the coastal districts facing the mainland of Asia.[26]

In these southern and southeastern parts of Japan the tea acreage is further concentrated and the favorable sites generally comprise mountain foothills and terrace uplands. Thus in Japan's famous Shizuoka Prefecture the areas of maximum production embrace the foothills of the sedimentary-rock mountains and many terraces and foothills of the volcanic ash cones of Fuji and Ashitaka. The porous ash-covered mantle rock of the latter areas greatly favor production, since the tea plant requires not only an abundant rainfall but also well drained soils that have sufficient depth for the deep top root system of the tea plant. In many districts the ash mantle conceals relatively infertile sands and gravels, and makes possible production in areas where agricultural utilization would be very narrowly limited. Yet ash itself is relatively low in plant foods, partly by reason of the low fertility of the original ash deposits and partly because of leaching in this region of abundant precipitation. Upland crops, including tea, must be heavily fertilized because of the low content of readily soluble minerals in the soil. In fact, the cost of manures is the single largest item of expense in the production of

[26] *Ibid.*, p. 20.

tea. It ranges from 35 to 40 per cent of the total costs of producing this crop.[27]

The tea is normally picked three times a year, with an occasional fourth picking, although the latter is not recommended. Much the largest and most valuable, the first, or May picking, consists of clipping the upper three to five leaves of the new shoots. A month later the crop is picked again, and in July or August the third clipping of the leaves takes place; but in value the first picking normally exceeds that of the other two combined by a considerable margin.[28]

In contrast with the black teas of India and Ceylon, the Japanese product belongs to the class known as green tea, the natural color of the leaf being preserved through a process by means of which the enzymes of fermentation are completely destroyed. This processing generally takes place immediately, the leaves being subjected to great heat, thus preventing fermentation.

Recent trends of the Japanese tea industry reflect serious competition with tropical tea-producing units in southern Asia, and since the beginning of the twentieth century increasing amounts of black tea have been consumed in the United States, which normally constitutes the chief market for Japan's green tea. It should be emphasized, therefore, that the competition for the American market has come mainly from tropical areas, such as Assam, Ceylon, and Java, where the year-round growing season and less expensive labor result in more numerous pickings, higher yields, and lower comparative costs than in Japan.

The mulberry.—The mulberry is one of the distinctive plants of Japanese agriculture and is basic to the silk industry, which in turn is surpassed in value and number of workers only by rice among the agricultural population of the country. In the natural state the mulberry maintains the proportions of a full-sized tree; but where it is cultivated for its leavês, as

[27] Trewartha, Glenn T.: "A Geographic Study of Shizuoka Prefecture, Japan," *Annals of the American Association of Geographers*, Vol. XXVIII (1928), p. 202.

[28] *Ibid.*, p. 205.

is the case in Japan and China, the plant is cut relatively close to the ground, leaving a short trunk from which tender shoots protrude, which give it the appearance of a bush. However, mulberry trees are found in some districts, and in the highlands where intertillage is widely practiced, other crops are set out in alternate rows among the mulberry plants. In general, trees and bushes would cause an excess of shade for these crops, but the mulberry is kept almost constantly stripped of its leaves and does not appreciably interfere with their growth.[29]

Although the cultivation of the mulberry is widespread in Japan proper, the northern parts of the country have comparatively small areas devoted to this crop. Handicapped by a lesser amount of precipitation and lower temperatures, the northern prefecture of Honshu and the island of Hokkaido are less favored in the production of this valuable raw material than is semi-tropical Old Japan. But even in the latter area, certain prefectures show a further concentration of the mulberry acreage. Thus Nagano, the land-locked prefecture which straddles the crest of the Japanese Alps in central Honshu, surpasses all other political units of Japan in the production of this crop, with approximately 11 per cent of the mulberry acreage of the entire country.[30]

In this interior highland prefecture is found an abundance of slope land unsuited to paddy rice—land which is thin, stony, acidy, and even sandy in certain districts. Under such environmental conditions the mulberry is more profitable than rice or other food crops. Thus, in the Suwa Basin of Nagano Prefecture tiny mulberry patches cover the mountain foothills, extend from 300 to 650 feet above the basin floor, and are broken only by scattered patches of woodland on the steeper slopes. But in certain districts even rather abrupt slopes have been converted into terraced mulberry fields, extending in the form of narrow strips of land that follow the

[29] Semple, Ellen C.: "Influences of Geographical Conditions Upon Japanese Agriculture," *The Geographical Journal,* Vol. XL (1912), p. 600.

[30] Trewartha, Glenn T.: "The Suwa Basin—A Specialized Sericulture District in the Japanese Alps," *The Geographical Review,* Vol. XX (1930), p. 226.

contours.[31] In the Suwa Basin the cultural landscape reflects a widespread development of rice culture on the basin floor and mulberry culture on the mountain foothills, with rural habitations strung out in linear pattern along the base of the foothills. It is a concentrated district of Japanese sericulture, an alluvial-filled depression serving as a natural link on the trans-island railway line.

In other parts of Old Japan, mulberry patches may be found on ash-covered terraces, coarse-soiled alluvial fans, sandy outer parts of old beach ridges, and even on small elevated pieces of land in the fields of paddy rice.

The livestock industry in Japan.—Although the Japanese Islands contain a preponderance of highland (two-thirds of the total), the livestock industry is but poorly developed. Unlike the mountainous countries of Europe and the Andean republics of South America, where the grazing of livestock is widely practiced and where pastoral pursuits add life and character to the landscape, Japan is quite poorly supplied with various kinds of domestic animal life. In fact, Japan proper contains less than 25 head of cattle and approximately 26 horses for every 1,000 people; and with regard to hogs, goats, and sheep she shows even smaller proportions. Of sheep, she possesses only 11 per 100,000 people. Only in the northern island (Hokkaido) is livestock production of any importance, but even in this cooler northland the industry is on a low plane of development as compared with the livestock-producing areas of the New World and Europe. In the Japanese agricultural economy all available cultivable land —especially in Old Japan—is utilized for the production of crops, most of which are destined for direct consumption by the local population. In this densely populated country with its miniature farms, the production of crops for human consumption becomes a necessity—since a certain amount of grain, for example, contains several times as much food value as the meat or milk that can be produced from it. Where human labor is abundant and cheap, the question of animal

[31] *Ibid.*, p. 229.

power is not as serious as it is on the large farms of the New World. Moreover, Japan lacks any extensive natural pastures. Native bamboo grass is widely distributed, but this grass is considered innutritious and generally crowds out the more valuable, succulent grazing crops.[32] Thus far most of the attempts that have been made to improve Japan's livestock industry have shown no profits. It has been suggested, however, that there is some room for improvement, especially by employing the Swiss method of controlling the highland watercourses in such a manner as to water the grazing areas.

Agriculture in northern Japan proper—Hokkaido.—Northern Honshu and the island of Hokkaido present marked contrasts to the more densely populated southern districts of Japan. Even northern Honshu lies beyond the zones of tea and mulberry, and the cultural landscape reflects an agricultural economy in which various temperate zone crops, such as apples, potatoes, rye, oats, and hardy vegetables, play a relatively important role.[33] Here the rural dwellings are generally substantial frame structures with steep roofs and long projecting eaves, the latter feature being suggestive of the abundant snowfall in these northern districts.

The agricultural industry of Hokkaido differs from that of the southern islands in various significant respects, as indicated in the following features: (1) the large proportion of cultivable land which remains unused; (2) the much larger agricultural holdings, as compared with those of southern Nippon; (3) the lack of crop production during winter; (4) the importance of temperate zone crops; (5) the relatively greater importance of the livestock industry as compared with that of the southern islands; and (6) the substantial buildings made necessary by reason of rigorous climatic conditions.

Although Hokkaido compares favorably with southern Nip-

[32] Semple, Ellen C.: "Influences of Geographical Conditions upon Japanese Agriculture," *The Geographical Journal*, Vol. XL (1912), p. 595.

[33] For a type study of a geographical unit in northern Honshu see Trewartha, Glenn T.: "The Iwaki Basin—Reconnaissance Field Study of a Specialized Apple District in Northern Honshu, Japan," *Annals of the Association of American Geographers*, Vol. XX (1930), pp. 196-223.

pon in the proportions of lowlands and highlands and the general character of the major land forms, it differs strikingly in climate, natural vegetation, and economic development. Its climate, the modified humid continental type, is more like

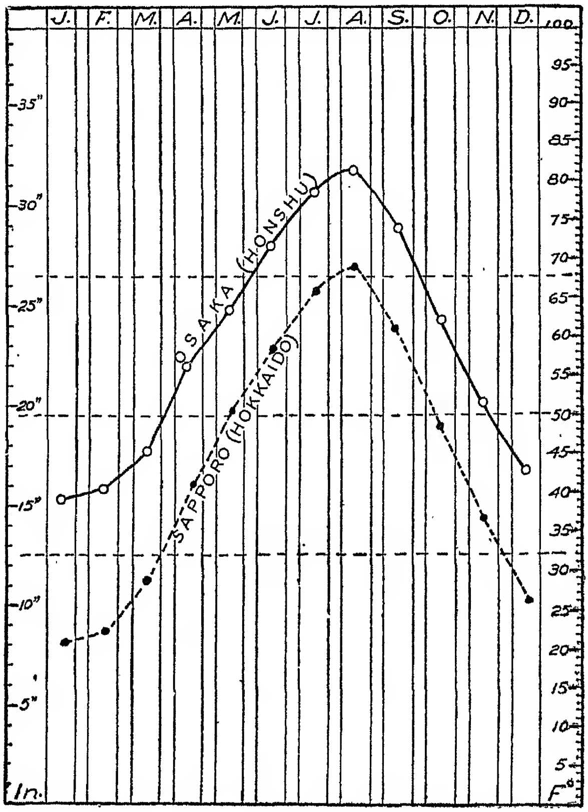

Fig. 144.—Showing the mean monthly temperature differences of southern Honshu and the island of Hokkaido, as indicated by the records at Osaka and Sapporo.

that of New England than Old Japan (Fig. 144). Virgin pine and oak forests still cover much of the land, and only half of the cultivable land is utilized for crop production. The cultural landscape reflects the importance of temperate zone crops. Unlike Old Japan, with its predominance of rice and extensive areas of mulberry and tea, this northern island has beans, peas, potatoes, hardy vegetables, and temperate zone

cereals. Rice, however, is also grown, especially in the valleys located in the southern part of the island, where the summers are sufficiently warm and long to ensure a satisfactory harvest. Moreover, in Hokkaido the rigorous winters preclude the production of crops during winter, and necessitate the construction of substantial buildings for both people and livestock.

Hokkaido and Japanese settlement.—Located at no great distance from Old Japan and comprising fully one-fifth of the total area of Japan proper, Hokkaido might appear to be an island that is well suited to Japanese settlement, especially in view of the fact that Old Japan is a densely peopled land in which the population pressure is causing much concern at the present time. In fact, the casual observer might wonder why Hokkaido still contains such large stretches of cultivable land.

Among the factors that have a bearing upon this problem of Japanese occupancy of Hokkaido, the following are noteworthy: (1) The Japanese are strongly bound to the homeland, with its traditions, customs, and religious festivals, and in general show no enthusiasm to leave their much-loved country for foreign lands. (2) Rice is their chief foodstuff. The fact that approximately 50 per cent of their cultivated land is devoted to rice culture is a reflection of the great demand for this commodity as well as the favorable environmental conditions which have made possible abundant yields per acre. In addition, large quantities of rice are imported in order to supplement their domestic supply. The belief that Hokkaido is poorly suited to rice culture has retarded the Japanese settlement in this northern island. At the present time, however, rice is one of the major crops in the lowlands of southwestern Hokkaido. (3) By reason of its poleward location, Hokkaido possesses a climate that is more rigorous than that of Old Japan. In this area the home-loving Japanese would have to contend with frontier conditions, and clear the land of its stands of conifers and broad-leaf trees. A study of Japanese migrations discloses no marked inclinations on the

part of these people to cope with frontier conditions. (4) The low winter temperatures of Hokkaido preclude the construction of ordinary thin-walled (bamboo, thatch, paper) structures so characteristic in the southern islands. The more substantial, warm buildings of Hokkaido are more expensive to construct, a fact that must be seriously considered by the poor, migrant Japanese.[34]

Japan's population as related to food supply.—The sudden rise of the Japanese from a secluded, little known people to the rank of a great power, commanding forcibly the attention of the civilized world, is noteworthy. Associated with her commercial and industrial development, she has experienced a remarkable increase in population. In fact, since 1860 her population has doubled, and at present Japan proper possesses approximately 65,000,000 people. Since Japan opened her doors to world commerce, this phenomenal increase in population was regarded as a favorable factor in her national economy and appeared to be in harmony with the Japanese concept of a strong nation. During a five-year period (1925-1930) the average annual increase of births over deaths amounted to 883,852 and the population question is becoming increasingly significant in this already densely populated land. In fact, the Imperial Government has created a commission whose chief function consists of investigating the problems of population as related to food supply. It has, indeed, become a vital question to the Japanese people, and has been forcibly expounded by the newspapers and periodicals of the country.[35]

The phenomenal increase of Japan's population was associated with the opening of her doors to foreign influence, especially contact with the Western World. In fact, for a period of approximately two centuries the population was

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[34] See the excellent study of this northern island by Jones, W. D.: "Hokkaido, the Northland of Japan," *The Geographical Review*, Vol. XI (1921), pp. 26-30.

[35] For an excellent article on this subject see: Orchard, John E.: "The Pressure of Population in Japan," *The Geographical Review*, Vol. XVIII (1928), pp. 374-401.

essentially stationary. It marked the period of the Tokugawa Shoguns, during which time a number of factors checked population increase: the resources of the country were not used to best advantage; transportation was poor, and, indeed, sea-going vessels were destroyed in order to hinder contacts with the outside; agriculture, the chief source of wealth, suffered by reason of the hampering restrictions of feudalism and because of the lack of opportunity to specialize in the production of those commodities for which certain districts of the country might be best suited.

With the opening of Japan's doors to world trade, transportation developed with remarkable rapidity. Densely populated districts, which, because of earthquakes, floods, or storms, had suffered great losses of life during the period of seclusion, could now get commodities from other parts of Japan as well as from foreign countries. Through trade (external and internal), markets were developed for agricultural products. Geographical specialization in agricultural production was realized. Among the agricultural crops, rice still maintained first rank, but certain crops that were relatively important during the period of the Tokugawa Shoguns declined in relative importance. Others were introduced to an ever increasing extent. Thus, cotton was widely grown at one time, as one would expect in a semi-tropical climatic region where much cotton clothing is worn and where self-sufficiency was the keynote in the agricultural economy. With the opening of her doors to world-wide commerce, Japan could obtain raw cotton cheaply from India and the United States, and could devote her narrowly limited areas of cultivable land to more intensive agricultural pursuits. She has given more of her land to mulberry fields and food crops, as reflected in the fact that since the last quarter of the nineteenth century Japan's mulberry acreage has increased while her cotton acreage has declined. In some prefectures much land that was formerly devoted to soy beans is now producing rice, and the beans as well as soy bean-cake fertilizers are imported from Manchukuo. Crop production gravitated toward those districts in

which the environmental conditions were most propitious, and specialization was therefore facilitated, as, for example, the production of tea in Shizuoka Prefecture. The combination of these factors, with that of the change in attitude toward the size of the family, account in large part for the increase in the population of Japan.

What is the solution to such phenomenal population increase, and what are the lines of development, if any, that can take care of this growth? Among the factors, which singly and in combination have a marked bearing upon this problem are: (1) possible increase in cultivated land in Old Japan; (2) possible future expansion of agriculture in other parts of Japan proper and in the Japanese Empire; (3) possible increase in yields per acre of chief agricultural crops; (4) the possibilities of a change in the kinds of food consumed in Japan, and the possible introduction of high-yielding crops in the system of agriculture; (5) emigration; and (6) industrialization.

With her cultivated land comprising only 15.6 per cent of the total area, it would appear at first glance that here lies a partial solution to this pressing problem. But it must be emphasized again that the country is narrowly limited in cultivable land mainly by reason of unfavorable topographic conditions. Practically all easily available, fertile land has long been extended in the form of terrace culture, even up relatively steep slopes. However, it has been pointed out that the existing cultivated area may possibly be increased by some 33 per cent by utilizing marginal lands and by lessening the unproductive area now occupied by boundary ridges and footpaths. Additional land is being reclaimed every year, but in amounts that fall short of satisfying the increasing demands for food. Many of the recently reclaimed districts—especially in highland foothills, coarse-textured alluvial fans and diluvial terraces—have been converted into mulberry fields. Even the proposal by the Japanese commission on food and population to reclaim 75,000 acres of land a year will scarcely care for

more than 150,000 additional people per annum, or less than 20 per cent of the yearly population growth.[36]

Migration of Japanese to other parts of their empire has taken place in the past, and presents further potentialities. To the north of Old Japan lies the island of Hokkaido, in which only half of the cultivable land is utilized. For reasons already enumerated (See page 405), this island has not been especially attractive to the Japanese settler. To the north of Hokkaido, the island of Karafuto—with an environment and human occupations quite similar to those of Newfoundland—is even less attractive to the rice-eating, home-loving Japanese, who are accustomed to a semi-tropical climate and are but little interested in the hard life associated with frontier conditions. On the other hand, Formosa (Taiwan), with its tropical climate, is more attractive to the Japanese. Its climate may be compared with that of Cuba; and like the latter island, it has become one of the world's leading producers of sugar cane. But this island, as well as other parts of the empire, can absorb the rapidly expanding Japanese population only as the resources are gradually developed. Its 13,000 square miles of land—a part of which has already been developed—offer no immediate solution for Japan's population problem. In addition, it should be emphasized that the more attractive, fertile lands of Korea (Chosen) and Kwantung are already quite densely peopled.

A more intensive agricultural economy in Old Japan may appear to be a significant factor. But it must be remembered that Japanese agriculture is already highly intensive in character, and that she has increased her yields per acre of rice to such a level that any noteworthy additional development in this respect is not to be anticipated. Her rice lands greatly surpass those of other leading producers in yields per acre, which, indeed, are more than double the rice yields per unit area obtained in the United States and in the Philippines. The maintenance of such an intensive system of agri-

[36] *Ibid.*, p. 390.

culture calls for an abundance of fertilizers, large amounts of which are now obtained from Manchukuo in the form of soy-bean cakes.

In the Western World a much greater variety of foods plays a part in the average man's diet than in Japan, where rice is so singularly important. There are various crops, especially starchy tubers, that have considerable possibilities of yielding abundant returns per acre, but any noteworthy change in the Japanese diet is unlikely; and as a factor in alleviating the population pressure, it should be considered of minor importance.[37]

Countries which lack large colonial possessions find emigration to be one of the safety valves to population pressure. But the Japanese have not migrated in any great numbers, and in 1930 there were less than 519,000 Japanese subjects reported as residing abroad. These have gone mainly to Manchukuo, the United States, Hawaii, the Philippines, and Brazil. Even Manchukuo with its broad expanses of cultivable land has not been very attractive to the home-loving Japanese (Page 542). Thus a study of the emigration records discloses no appreciable exodus of Japanese to foreign areas; and as a factor in solving her population problem, emigration thus far has been only of minor importance.

Just as the British Isles have become highly industrialized, so it is suggested by some that this so-called "Britain of the Orient" has certain possibilities. Japan is largely agricultural and her local agricultural production satisfies domestic demands to the extent of 90 per cent of the total amount of all foodstuffs consumed. Such is quite the reverse of British development, where their local production of foodstuffs would last the nation scarcely more than six weeks. The foundations of Britain's economic strength lie in industry and commerce. A large number of her total population are factory workers. Thus it is suggested that a comparable industrialization of Japan might serve as a safety valve for her increasing millions. The extent to which industrialization has taken place

[37] *Ibid.*, p. 391.

in Japan and the future possibilities of such development will be considered in the following chapter.

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CHAPTER XXI

Manufacturing and Commerce of Japan Proper

Distinguishing characteristics of Japanese industry.—A study of the Far East discloses clearly the distinctive position that Japan occupies among the nations of the Orient with respect to industrialization. Since the China-Japan War of 1894-1895, Japan has made rapid strides in industrial life and has availed herself of much of the skill and technique in manufacturing that evolved in western Europe and in the United States. This phenomenal industrial growth has suggested the term "Britain of the Orient" as being quite applicable to the Japanese archipelago, yet she shows no comparable percentage of factory workers engaged in the large-scale labor-saving specialized production that one finds in the British Isles. No other nation of the Orient, however, mines so much coal and copper, uses so much hydroelectric power, or exports so much cotton cloth and silk as does Japan. Woolen goods, earthenware, glass, paper, toys, and matches are also noteworthy among the manufactures of Nippon.

Various factors have facilitated Japan's industrial progress, yet there are also very definite limitations in the physical equipment of the country. Among the favorable factors or advantages in the geographical environment may be mentioned: (1) mineral resources, especially coal and copper; (2) favorable sites for hydroelectric power development; (3) climatic conditions less enervating than those of humid tropical Asia, which at the same time favor the production of various kinds of raw materials considered basic in the industrial life of the country (silk, for example); (4) favorable location with regard to raw materials and markets, especially in the Orient; and (5) an abundance of cheap labor. In ad-

dition, the non-geographical factor of government protection to industry must be emphasized. On the other hand, Japan's mineral reserves are not large. Her easily accessible coal will probably last no longer than half a century, but with respect to this mineral there seems to be no immediate alarm. The accessible iron ore deposits of Japan proper would last the United States less than one year; and, with the exception of copper, many other minerals are either essentially lacking or are found in such small quantities as to be of but little value in the industrial life of the nation. Moreover, although the Far Eastern markets at present absorb vast quantities of Japanese goods, especially cotton textiles, it is probable that Japan will encounter competition as China, with its much more abundant resources, gradually becomes more highly industrialized.

As a late-comer among the industrial nations, Japan suffered from competition with foreign areas in which factory-made goods had long been established. Government protection was deemed necessary to coddle her infant industries. Through tariff manipulations the Japanese government has taken an active part in the development of textile industries and iron and steel manufactures as well as lumber, paper, and chemical plants. Government assistance has been basic to the evolution of Japan's vastly important silk industry by improving the quality of the silk fiber. The Japanese farmers have been taught scientific methods of fighting silkworm diseases, and the trades people have been aided by the construction of warehouses with government funds.[1]

Industrial development appears to be one of the safety valves for the rapidly increasing Japanese population. To obtain security of basic raw materials and to establish markets for her goods, Japan has reached out to various parts of the commercial world, especially China, Manchukuo, India, and the United States. Any interference with either the security

[1] Orchard, John: "Can Japan Develop Industrially?" *The Geographical Review*, Vol. XIX (1929), pp. 177-200.

of raw materials, as for example in Manchukuo, or markets, as in China, strikes at the very life-blood of the Japanese nation. A boycott of Japanese goods in the Shanghai area of China in 1931 brought about immediate Japanese military aggression in the delta region of the Yangtze Kiang, where the Japanese rather effectively checked the movement of trade in the Yangtze Valley by blocking the sea gate to this area.

Importance of the Japanese silk industry.—Among the various types of manufactures of Japan, the silk industry is noteworthy. Its workers are agricultural as well as industrial. The raising of cocoons and the production of raw silk are, therefore, vital to Japanese industry and commerce. To the Japanese farmers, sericulture, with 2,000,000 out of the 5,500,000 agricultural households of Nippon, occupies a rank next to that of rice production. As a cash crop, the cocoons are much more important than tea, the other major money crop. Commercially, raw silk is Japan's leading export, most of which finds a market in the United States, where in value it has long been the chief import. During the period 1929 to 1932, Japan exported raw silk valued at $212,166,000 annually, which amounted to 32 per cent of her total exports.

Development and competitive position.—The rapid rise of Japan to leadership as a raw silk producer has taken place since the beginning of the present century. In fact, the increasing world demand for silk has been met mainly by increased production in Japan, whereas other silk-producing countries have remained practically stationary. Japan has thus secured a definite lead over China, the second largest producer, and in normal times exports more than half of all the silk that enters foreign trade.

Compared with China, the larger production in Japan appears to be due mainly to more scientific methods, to the better organization of labor in the Japanese industry, and to the more dependable and modern commercial methods used in handling the product and in establishing trade contacts. In both countries—Japan and China—the production of cocoons

is a household industry, but in present-day Japan the reeling of silk from the cocoons is done to a large extent by means of steam filatures.

Another basic reason for the noteworthy sericultural development in Japan is that the Japanese government has taken an active part in the industry. In China the farmer generally selects his own silkworm eggs, whereas in Japan the selection is left to government experts. Thus a large proportion of the Chinese silkworms die before they are hatched because of the dirty and diseased eggs, whereas those of Japan yield large returns of cocoons—approximately five to six times the yields in China.[2] In Japan the government encourages scientific study, builds warehouses to store silk, and strives to satisfy the requirements of the leading purchasers, especially those of the American market.

Silk production and labor supply.—Although the reeling of silk from cocoons is performed mainly by means of steam filatures, the silk that is reeled in the homes on hand machines is of excellent quality. Even the power reeling, however, requires much attention and deft handwork, since the reeler has to start the reelable ends and must repair the breaks. Uniformity of grade also calls for judgment in the part of the workers in the selection of cocoons and in deciding the number of cocoon ends that shall be run together at any time. Since even parts of the same filament frequently vary in size, considerable caution must be used in the process of reeling in order to obviate the necessity of re-reeling the raw silk. It must therefore be emphasized that an abundance of time and labor are necessary in this industry. Since the labor can be obtained more cheaply in China and Japan than in western Europe and the New World, the latter areas find it extremely difficult to compete with the Far East in the production of silk.

The localization of production.—Although the silk industry is widely distributed in Japan proper, there are areas of con-

[2] Wheeler, Leslie A.: "International Trade in Silk," *Trade Information Bulletin*, No. 283, Washington, D. C., p. 6.

centration in some districts. Thus Nagano Prefecture, located to the northwest of Tokyo and Yokohama in the Japanese Alps of central Honshu, is the most specialized region of sericulture in Japan. Here production of cocoons is approximately twice that of any other prefecture, and in silk reeling this area occupies an even more noteworthy position, with approximately 27 per cent of the national output.[3] Although the environment of this area favors the industry, the time factor has also played an important part. Prior to the opening of her doors to world-wide trade, Japan produced raw cotton sufficient to satisfy her own domestic requirements. This production took place to a great extent in the southern and southeastern coastal plains. Thus Nagano Prefecture, located between these plains and the non-producing western and northwestern districts, functioned in the processing and distributing of this cotton. Cotton spinning gave way to the more important industry of silk reeling as Japan procured raw cotton from the extensive agricultural lands of India and the United States.[4]

Major factors affecting silk reeling in this part of Japan are: (1) relatively abundant, pure waters (filatures consume an abundance of water); (2) location in the area of most concentrated cocoon production; and (3) relatively drier and cooler atmospheric conditions than are to be found in the coastal lowlands to the south and southeast. These factors, however, are also found in more widely scattered parts of Japan and are not confined only to Nagano Prefecture. They must, therefore, be thought of in connection with the momentum of an early start or inertia which has carried the industry to its present significant position in Nagano Prefecture.

Silk trade of Japan.—In the raw silk trade of the commercial world, Japan occupies first place, followed by China and Italy. With an island location and a well-developed inland system of commerce and transportation, Japan has a marked

[3] Trewartha, Glenn T.: "The Suwa Basin, A Specialized Sericulture District in the Japanese Alps," *The Geographical Review*, Vol. XX (1930), p. 240.

[4] *Ibid.*, pp. 238, 239.

advantage over China, where transportation in the interior is still poorly developed. The Japanese, moreover, have applied a high degree of science and skill to the production of raw silk; their skeins of raw silk are wound in such a manner—a diamond-shaped formation known as Grant reeling—as to meet the American needs. The latter country normally takes approximately 95 per cent of all the raw silk exported from Japan (96.5 per cent in 1931).

In the marketing of Japanese raw silk, the so-called "raw silk factors" or agents occupy a position of primary importance. It is through these agents that silk is purchased from the filatures and sold to exporters. The factors extend loans to the filatures and thus establish a close relationship with the primary source of supply.[5]

Because of the fluctuations in the price of silk, associated with periods of prosperity and depression, attempts have been made to regulate the output of the raw material. Restriction of output has therefore been suggested during recent years because of the decreased consumption, especially of the United States and other importing countries. Moreover, the seasonal nature of the industry, with three crops of cocoons—spring, summer, and autumn—tends to create certain periods of superabundance; and prices would ordinarily fall considerably, since the Japanese workers are anxious to get returns on their capital as quickly as possible. Thus a stabilizing system has been adopted by the Imperial Raw Silk Company by means of which the raw silk is stored and placed on the market gradually as the prices rise.

Magnitude of the cotton textile industry.—The cotton spinning and weaving industries are the most important modern factory enterprises in Japan. Among the countries of the Orient, Japan is surpassed only by India in number of cotton spindles, approximately 90 per cent of the Japanese spindles being operated by member mills of the Japanese Cotton Spinners Association. This industry not only gives employment to

[5] The rate of interest charged in the making of these loans is generally fixed by the Raw Silk Factors Association.

a great number of workers, but it draws heavily upon the United States and India for supplies of raw cotton. In fact, Japan is normally one of the three leading purchasers of American cotton, importing more than $95,000,000 worth of raw cotton annually from the United States during the period 1929-1932. In addition, the industry has grown to such a magnitude as to be a serious competitor with that of the British Isles and the United States in the markets of the Orient.

Geographical localization of production.—The cotton spinning and weaving industries of Japan, like the raw silk industry, show a major area of concentration. Thus the cotton textile industry has gravitated mainly toward the districts in and about Osaka; although its foreign commerce is so closely allied and interdependent with that of Kobe, situated 20 miles away, that the two centers with their tributary areas are often considered as one major industrial and commercial district. Through these points pass not only the raw materials for the cotton industry, but a major part of the cotton piece goods.[6]

Competitive position of Japan.—The rapid development of Japan's export trade in cotton cloth is a matter of vital interest and much concern to competing nations. In the period 1925-1930 Japan exported on the average 1,435,000,000 square yards of cotton cloth a year, or more than 2.8 times the amount sent abroad by the United States and approximately 40 per cent of the amount exported by the United Kingdom, the world's largest exporter of cotton piece goods. With ever-increasing quantities of cotton goods sold in the large consuming markets—such as China, British India, the East Indies, Egypt, and the Near East—the cotton piece goods trade of Occidental countries in the Orient is threatened by the success of the Japanese. A study of the United States and Japanese cotton piece goods exports since 1914 to the port of Aden and to China shows a marked increase in the Japanese shipments of cotton cloth, whereas those of the United States show a decline. Japanese inroads on the American trade in the

[6] *Foreign Crops and Markets* (May 2, 1932), Washington, D. C., p. 693.

Philippines have been of serious concern to the American exporters in recent years, and competition has been intensified by the introduction of cheap rayon fabrics from Japan. Thus within recent years the Japanese industry has gradually captured markets in various parts of the world—markets which had formerly been practically controlled by the cotton industries of other countries.

Advantages and disadvantages.—This phenomenal development in Japan has been favored by a number of factors, among which one finds: (1) an abundance of cheap labor; (2) nearness to major Oriental markets; (3) well-organized selling of cotton products; (4) subsidized freight rates; and (5) ability to use a larger proportion of the cheap Chinese and Indian cotton than are the mills of other countries.

It must be emphasized, however, that the low wages in Japan are in great part offset by the greater effectiveness of production in the cotton goods industries of the United States and the United Kingdom. But the demand in China and other Oriental countries for "coarse" yarns (under 20 counts) was a fundamental factor in the development of the Japanese industry, by reason of the fact that cheap female labor can be utilized advantageously in such work. The exports of Japanese coarse yarns, however, have shown a decline during the last decade, whereas the piece goods shipments now are surpassed in value only by raw silk.

The raw material factor.—Before Japan opened her doors to world trade, self-sufficiency was the keynote of her national economy, and the clothing industry was supplied with domestic raw materials. World-wide contacts, however, meant specialization in the production of commodities in districts where the environmental conditions were most propitious. Her mulberry acreage increased while her cotton acreage declined. Shizuoka Prefecture became a highly specialized unit in the production of tea. The narrow-limited land area could be more advantageously utilized for certain foodstuffs, especially rice; whereas cotton could be obtained in vast quantities from the much more extensive agricultural lands of the American

Cotton Belt and India. Today these areas are the chief source of raw cotton utilized in the Japanese textile industry.

Japan normally consumes large quantities of Indian and American raw cotton. It is one of the three major export markets for American cotton, the others being the United Kingdom and Germany.[7]

The outlook.—Although the Japanese cotton textile industry of the factory type is mainly a product of the present century, it has attained a prominent place in the commercial world—a development which is noteworthy when considered in the light of raw material imports and moderately large imports of machinery. Yet the handicaps have been in large measure offset by the cheap labor and nearness to the major markets of the Orient in which large quantities of coarse-grade cotton piece goods are consumed. The security of the industry seems to be reflected in the fact that no material decrease in production was experienced until 1930, and then only by reason of the acute depression throughout the commercial world, whereas the cotton spinning industry in various other countries had suffered from continued depression for several years while the Japanese industry was expanding.

Post-war development of the iron and steel industry.—As a large-scale modern enterprise, the iron and steel industry of Japan dates from the period of the World War. Although progress had been made even prior to 1914, the industry received special consideration locally when the imports of iron and steel from foreign countries were virtually cut off. This development, therefore, was associated with a period in which war-time profits placed pig iron on an abnormally high price level (600 yen a ton). Subsequent price decline to a small fractional part of the war-time price of pig iron (32 yen) meant failure for many of the plants which lacked the necessary capital, resources, and location to make operations possible in the face of severe local as well as foreign competition.[8] Many

[7] Moser, Charles K.: "Export Trade Essential to Japanese Cotton Industry," *Commerce Reports* (Feb. 2, 1931), Washington, D. C., p. 262.

[8] Dowd, William S.: "Iron and Steel Industry of Japan, Its Present Situation," *Commerce Reports* (June 27, 1932), Washington, D. C., pp. 769, 770.

inefficient units developed during the boom years, and plants were not always well designed and laid out. Yet the Japanese iron and steel industry, as a whole, has shown a gradual increase during post-war years, especially the last decade (1920-1930). Such growth was made possible in large part by the aid of government subsidies.

The resource situation.—A study of the raw materials used in the Japanese iron and steel industry discloses the fact that the country is not self-sufficient; and with regard to the future, any appreciable development would result in a considerable shortage of these basic resources. Even at the present time the domestic deposits of iron ore, by reason of their character, extent, and location, do not satisfactorily meet the needs of this industry, and the local production must be supplemented with pig iron and iron ore imported from the neighboring sources of supply, such as Chosen, Manchukuo, China, and the Straits Settlement. In addition, steel and scrap iron are obtained from various sources, including the United States. Another critical problem of this industry is to have available enough coke or coking coal to transform the iron ore into usable form. With regard to the limestone factor, however, there appears to be a sufficient supply.[9]

The iron ore factor.—The total iron ore reserve of Japan proper (exclusive of iron sands) that may be utilized under present-day mining operations is approximately 40,000,000 metric tons—a reserve that would last the iron and steel industry of the United States less than one year under normal conditions. Chosen contains from 10,000,000 to 40,000,000 tons of additional reserves, and iron ore deposits occur also in Taiwan, so that the total reserves of the Japanese Empire are possibly 80,000,000 tons of iron ore that may be utilized under existing metallurgical processes and mining operations.[10] Further surveying, however, is necessary before the reserves are known with exactitude.

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[9] *Ibid.*

[10] Ehlers, J. H.: "Raw Materials Entering into the Japanese Iron and Steel Industry," *Trade Information Bulletin*, No. 573. Washington, D. C., 1928, p. 2.

A critical problem facing the Japanese iron and steel industry is that of securing and maintaining an adequate supply of good quality iron ore, especially with regard to future development. The largest utilizable iron ore reserves of Japan proper are found in Iwateken (northeastern Honshu), and in Hokkaido. Mining in Iwateken is concentrated at Kamaishi, which is also one of the two major iron and steel producing centers of Japan, the other being the Yawata Steel Works located at Yawata in the northern part of Kyushu. By reason of location and general proximity of ore, the latter center gets a large part of its raw material (iron ore and pig iron) from Chosen, China, Manchukuo, and the Straits Settlements.

Relationship to Manchurian iron production.—With a total reserve of more than 730,000,000 metric tons of iron ore, Manchukuo surpasses all of the countries in the Far East in abundance of this mineral, and it would appear at first glance that Japan should draw heavily upon such a large reserve. In fact, the iron ore factor often enters the question of Japanese intervention in Manchukuo. But it must be emphasized that the iron ores of Manchukuo have a low metallic content, ranging on the average from 34 to 37 per cent.[11] Because of this low-grade ore and the local production of coal, pig iron is produced in Manchuria in large plants which are operated under Japanese control. But the export trade of this material to Japan has shown a decline during recent years, and at present represents less than 10 per cent of the total consumption of iron and steel in Japan proper.[12] Before this pig iron reaches the Japanese consumers, its cost is enhanced by rail charges to Dairen, commission charges, freight rates to Japan, and import duties. In fact, the pig iron when laid down in Japan has exceeded the cost of producing this same material at the Kamaishi Iron Works of northern Honshu.[13]

The coal factor.—Another of the major problems of the

[11] Stewart, John R.: "Japan and the Manchurian Iron Industry," *The Journal of Geography*, Vol. XXXII (1933), pp. 181-191.

[12] Palmer, J.: "Iron and Steel in Manchuria," *Commerce Reports* (Dec. 28, 1931), Washington, D. C., pp. 734-735.

[13] *Ibid.*, p. 735.

Japanese iron and steel industry is that of obtaining an adequate supply of satisfactory coke at reasonable prices. Although Japan proper possesses a total coal reserve of approximately 8,000,000,000 metric tons, most of it is unsatisfactory for the making of coke.[14] Moreover, the price in general is high, mainly by reason of the thin seams in many of the districts, and the faulted structure which causes much trouble with seepage and gas. Thus the coal used in this industry comes not only from local but also foreign sources.

Of the local sources of supply, the Kyushu coal ranks first in meeting the demands for coal to be converted into coke and its by-products. The island of Hokkaido constitutes the next most important local source. But the coals of Japan proper are generally unsatisfactory for coking, and the high price and poor quality of the coke comprise major obstacles to the profitable development of the iron and steel industry of Japan.

Aside from the local sources of supply, coal is obtained from various places, especially China, Manchukuo, and Karafuto. Manchukuo possesses good quality coking coal, especially at the Penhsihu collieries. But at Fushun, coal is quite commonly mixed with Penhsihu coking coal before it is converted into coke. Although this mixed product is satisfactory for the making of coke while it is still freshly mixed, it loses its coking qualities rapidly after shipment—a factor of great importance with reference to usability far from the source of supply.[15]

Domestic consumption and local supply.—To an ever-increasing extent the domestic production is supplying iron and steel to the domestic Japanese market. Thus in 1929 the domestic production of iron and steel accounted for 72.5 per cent, with the remaining 27.5 per cent obtained through the import trade; whereas 1931 showed the proportions of 88.5 per cent and 11.5 per cent, respectively. Such development of

[14] In addition, there is readily available for this industry something over 1,000,000,000 tons of coal in Manchuria. Ellers, J. H.: "Raw Materials Entering into the Japanese Iron and Steel Industry," *Trade Information Bulletin*, No. 573, Washington, D. C., 1928, pp. 14-16.

[15] *Ibid.*, p. 15.

the local industry has been favored by generous government subsidies.

The outlook.—With industrialization favored through Japanese Government policy in this land of rapidly growing population, the iron and steel industry, like other major types of manufacture, shows signs of further development and expansion in the future. Although a steel industry of large proportions is not required in either Japan or other parts of the Orient, it is the ambition of Japan to produce her own steel. But the ultimate success of this industry depends upon the degree to which the finished product can be produced at a price which will meet foreign competition. At the present time the costs of raw materials per ton of pig iron are abnormally high, mainly by reason of the coal factor. Although Japan's own supplies of iron ore are inadequate, she obtains ore at a relatively low price from other places, in fact, at prices that compare favorably with those on ore laid down at Pittsburgh. On the other hand, one of the greatest obstacles to the economical production of iron and steel is that of the high cost of coke.

Although Japan is the leading iron and steel producer in the Orient, she is greatly surpassed by various of the world powers in the production of these commodities. During the period 1929-1932 Japan produced 1,524,000 tons of pig iron annually, which was equal to but 29 per cent of the production of this metal in the United Kingdom. During the same period Japan exported iron manufactures valued at $5,754,000 a year, whereas her imports in value of iron and steel amounted to $40,466,000 a year.

The paper and pulpwood industries.—Since the outbreak of the World War, Japan's paper industry has developed with remarkable rapidity. Ranking among the leading paper-producing countries of the world, Japan now not only produces sufficient amounts of certain kinds of paper to satisfy the domestic requirements, but is becoming a serious competitor of European countries and of the United States in the commercial world, especially in the Chinese market. Yet the

Japanese market absorbs various kinds of paper and paper products imported from Sweden, the United Kingdom, Germany, and the United States.

The Japanese paper industry consists of two major divisions, based upon the character of the finished product: (1) the production of native-style papers; and (2) the manufacture of foreign style paper. Dating back more than 1,000 years, the production of native-style paper is an old industry, and in many districts even today is largely a household industry, although the modern paper mills are rapidly taking over this type of manufacture. Distinguished by their extreme lasting qualities, toughness, and pliability, the native-style papers, are manufactured mainly from the inner bark of the paper mulberry tree (Japanese kozo or kodzu), of the Japanese mitsumata (Edgeworthia chrysantha), and of the Japanese ganpi (Wickstroemia ellipsocarpa). The so-called "hoshogami" is considered the best grade of the native-style papers, by reason of its thickness, even texture and gloss, richness of starch, and color, and is utilized mainly for diplomas, on ceremonious occasions, and for important public documents.[16]

Machine-made or foreign-style paper is the product of one of the most prosperous and progressive of Japanese industries. Development has been favored by a number of factors, among which the following are noteworthy: (1) coniferous forests in Honshu, Hokkaido, and Karafuto; (2) numerous waterfalls; (3) ample supply of working capital; (4) efficient management of plants; (5) introduction of the best modern machinery and labor-saving devices; (6) a high import tariff; and (7) a growing home market.

The chemical industry.—Among the industries of Japan which have shown a very rapid development during the last two decades (1910-1930), the chemical industry occupies a prominent place. Japan enjoys a monopoly in the production of camphor (natural) and menthol, most of which enters the foreign trade. Similarly, camphor oil is exported in large

[16] Frost, B. M.: "Paper Trade and Industry in Japan," *Trade Information Bulletin*, No. 672, Washington, D. C., 1930, p. 2.

quantities, mainly to the United States, Germany, and Great Britain. The coal-tar processing industry has made rapid progress, but this development has been definitely associated with assistance from the Japanese Government, under which it has been fostered, subsidized, and in general provided the necessary protection. Among other chemical manufactures, sulphur, iodine, potassium iodide from the subsidized kelp industry, and fertilizers are noteworthy.[17]

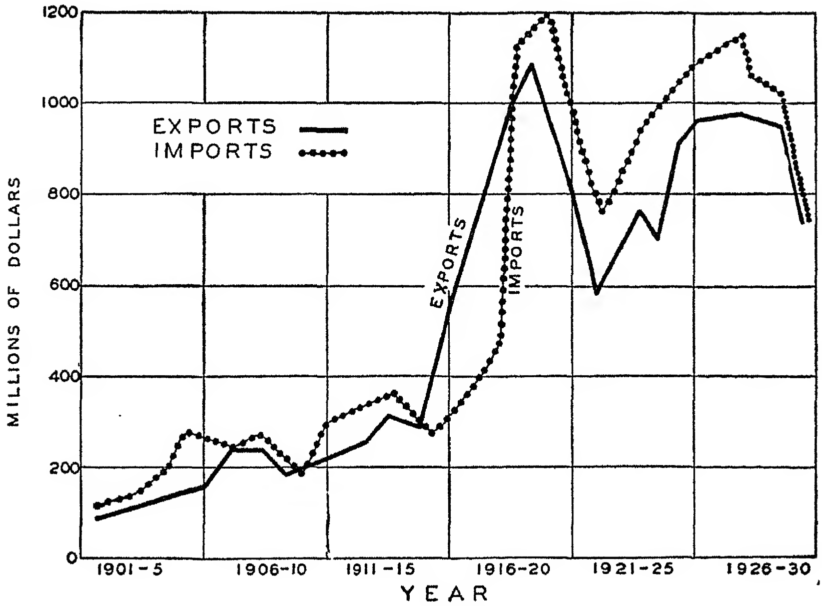

Fig. 145.—The average annual value of the exports and imports of Japan proper since 1901. (After U. S. Department of Commerce.)

Miscellaneous manufactures.—In addition to the manufactures discussed above, Japan contains a variety of industries, some of which have long played a prominent role in the national economy of the country. Thus the very important occupation of fishing has its manufacturing phase, and fish products are made in great quantities and even enter the

[17]Delahanty, T., and Concannon, C.: "Chemical Trade of Japan," *Trade Information Bulletin*, No. 217, Washington, D. C., 1924.

export trade.[18] Another of the old, basic manufactures is that of making pottery, a product which even today is classified among the leading exports of the country. Still other industries are engaged in the manufacture of lacquerware, matting, leather goods, oil, knittings, and matches.

Development and present status of foreign commerce.—The development of Japan's foreign commerce shows a phenomenal increase since that country opened its doors to

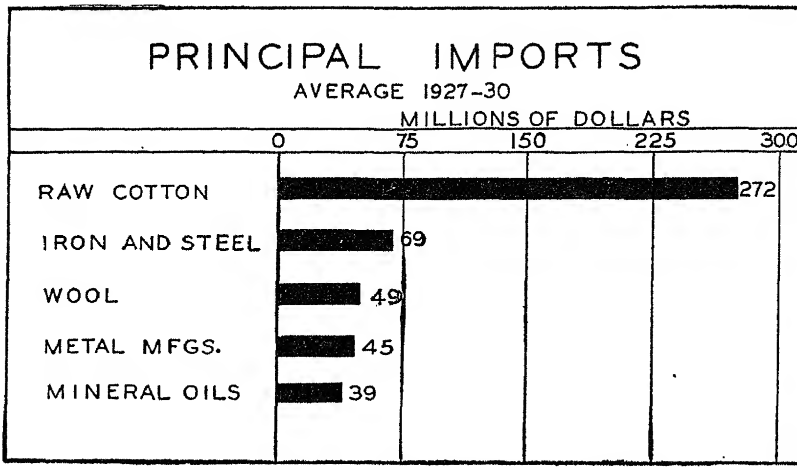

Fig. 146.—The leading merchandise imports of Japan.

world-wide trade (Fig. 145). In 1870 Japanese imports were worth less than $17,000,000, and in the subsequent 50-year period reached a total of more than a billion dollars a year.[19] Some of this commerce, however, is inter-imperial. Among the countries of Asia, only India competes on a comparable level in the value of exports and imports. Moreover, Japan has made serious inroads into the markets long monopolized by west European and American manufacturers, chiefly in

[18] The single item of canned crabs showed a valuation of more than $10,000,000 in 1930.

[19] Japan proper imported $1,100,000,000 worth of merchandise in 1919, and the value of imports remained over the billion dollar mark for the greater part of the period 1919-1929, with subsequent declines in 1930, 1931, and 1932, due mainly to world-wide depression.

the light industries such as textiles.[20] This development of Japanese foreign trade has been associated with improvements in communication, transportation, and specialization. Japanese wants as well as the power to satisfy them have been increased, and imports as well as exports show noteworthy gains. In addition, the entire trade structure has been favored by: (1) island position, with ready contacts internally as well

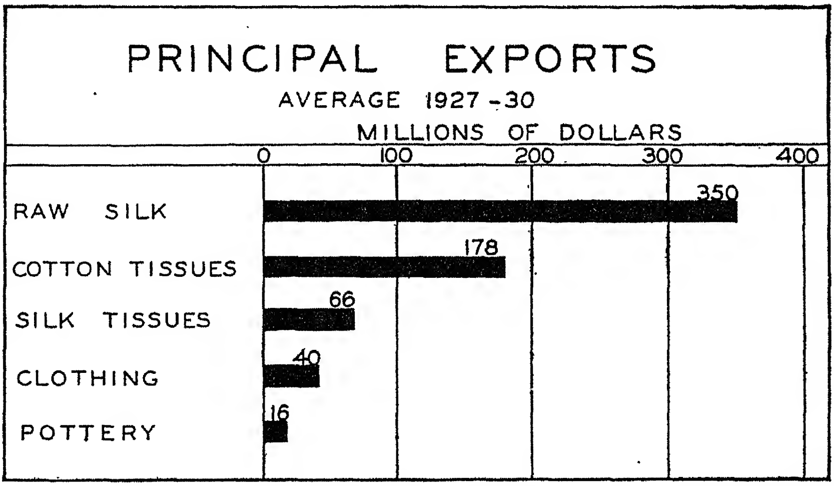

Fig. 147.—The leading merchandise exports of Japan. Note the predominant position of raw silk and textiles.

as with foreign lands; (2) development of maritime activities, in part under the stimulus of a tremendous fishing industry; (3) favorable harbors for the development of great ports; and (4) nearness to the large markets of the Orient.

Merchandise exports and imports.—The trends in the industrial development are clearly reflected in Japan's foreign trade. Thus the exports show a marked decline in the volume of foodstuffs and raw materials and an increased amount of manufactured or processed goods sent abroad, whereas the country is importing raw materials to an ever increasing extent. For example, raw cotton has become the leading item

[20] Kawakami, K. K.: "Britain's Trade War with Japan," *Foreign Affairs*, Vol. 12 (1934), p. 483.

of import, and cotton textiles are now second only to raw silk among the commodities shipped out of the country. In former years cotton textiles were one of Japan's staple imports. As typical commodities on the import list, one finds in addition to raw cotton items such as iron and steel, wool, metal manufactures and mineral oils; whereas the exports show raw silk, cotton tissues, silk tissues, clothing, and pottery (Figs. 146 and 147).

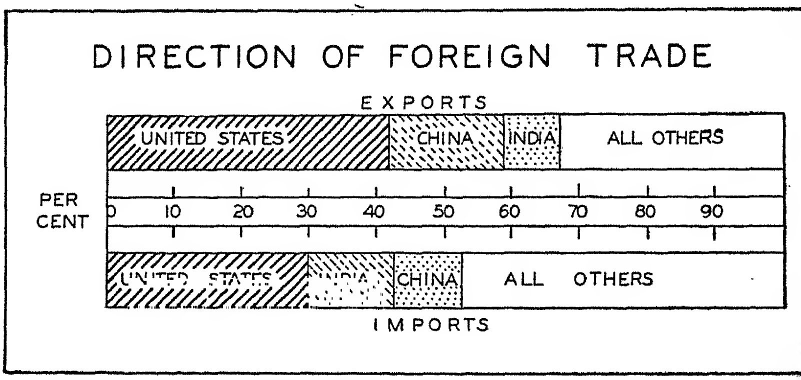

Fig. 148.—Diagram showing chief destinations of merchandise exports and major sources of imported goods. Note the important place occupied by the United States in Japan's foreign trade. (Averages for the period 1927-30.)

Recent trends show an increase of 24 per cent in exports and 27 per cent in imports during the years 1930 to 1933. The increase in Japan's world commerce during this four-year period would seem to indicate certain inherent advantages in the production of some of her principal exports. In general, Japanese goods have had to meet the same restrictions as have the goods of other countries, and in some of the markets of the world, quota regulations have seriously affected certain of the commodities which she sends abroad. Lacking in most of the raw materials which are considered essential to modern life, Japan is forced to import large quantities of goods. But in order to pay for the ever-mounting imports of raw materials, it is necessary for her to export almost as much in value as

she imports; since Japan has but few invisible items in her balance of international payments.[21]

Channels or directions of trade.—The foreign trade of Japan is conducted mainly with the United States, China, and India. The United States constitutes Japan's chief market as well as source of supply of imported merchandise (Fig. 148). Raw silk exports to the United States and raw cotton imported from that country are the chief commodities in this trade. India is the other major source of raw cotton, whereas China normally surpasses India as a market for Japanese goods (Fig. 148).

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CHAPTER XXII

Other Parts of the Japanese Empire

TAIWAN (FORMOSA)

The natural environment.—As the southernmost major political unit of the Japanese Empire, Taiwan lies astride the Tropic of Cancer, and is located but 90 miles from the coast of southern China, being separated from the latter area by the Strait of Formosa. By reason of its climate, the island presents a luxuriant vegetative cover, as suggested by the name Formosa (beautiful), which was given to it by the Portuguese. The Japanese, who acquired the island from China in 1895, adopted the Chinese term Taiwan, which today is the recognized official name.

In structure or build Taiwan forms part of the Circum-Pacific-Fold mountain belt. With its 13,429 square miles of land, it extends as an elongated oval in the direction of N.N.E.—S.S.W., and contains a lofty mountain axis in the eastern and central parts which follows the direction of the island's longer dimension. Thus the main water-parting lies in the eastern part, and the drainage pattern reflects a predominant east-west flowage of streams and rivers. Most east-flowing streams are short and in some cases tumble over magnificent sea cliffs into the Pacific. Only a few river plains and narrow coastal lowlands break the continuity of rugged highlands in the eastern rim of Taiwan. One of the lowlands is an important longitudinal valley which parallels the east coast in its middle part, and has been utilized by a government railway (Fig. 149).

It is western Taiwan, therefore, which contains the most extensive plains and agricultural lands, and constitutes the heart of the economic life of the island. Here the streams

follow more gentle gradients, deposit silt carried from the central and eastern highlands, and empty their waters into the relatively shallow Formosa Strait. The latter contrasts strik-

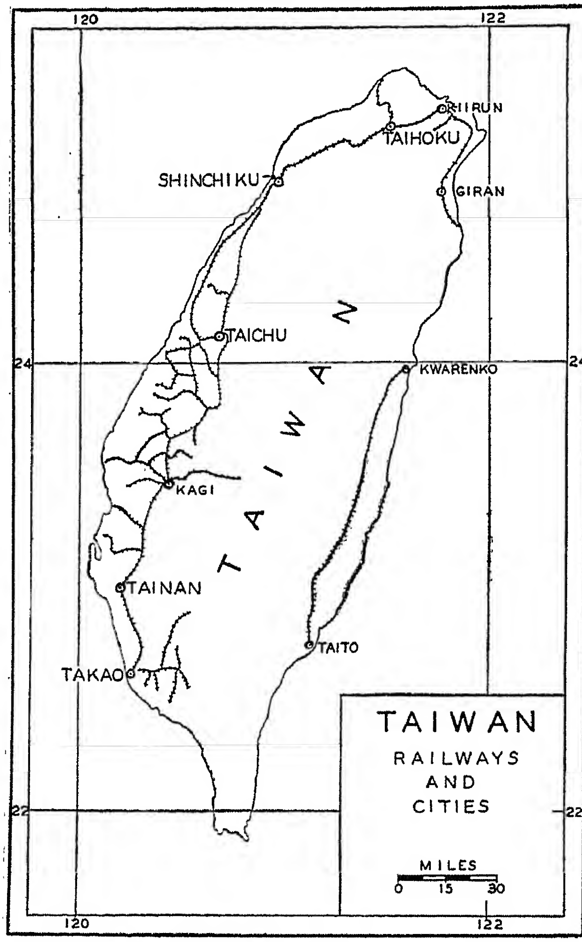

Fig. 149.—Map of Taiwan showing railways and chief cities.

ingly with the Pacific deeps off the eastern margin of the island and facilitates the growth of alluvial plains in this western region (Fig. 150).

Climate shows a close relationship to the relief and the location. Bisected by the Tropic of Cancer and surrounded by warm seas, the location suggests the prevalence of a tropical

climate; whereas the variety of relief has given rise to local climatic variations. The warm Kuro Siwo current bifurcates in the southern part of Taiwan, forming two branches which flow northward along the east and west coasts and bring

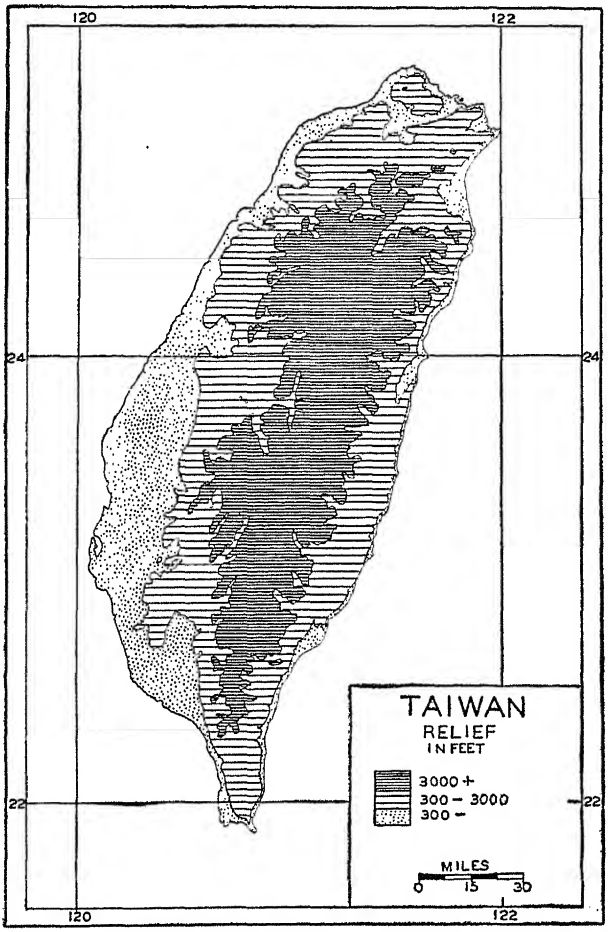

Fig. 150.—Relief of Taiwan. (Altitudes according to the Land Survey of Japan.)

warmth from equatorward areas. In the western lowlands the mean monthly temperature falls below 60°F. only in January, and Taichu (western Taiwan) shows a range from a mean monthly average of 59.2°F. in January to 81.7°F. in July, with a yearly average of 70°F. The interior highlands, on the other

hand, are usually capped with snow in winter, especially the Niitaka Yama, Setzu-Zan, Tsugitaka-Yama and Taito Mountains. The rainfall is abundant and quite well distributed throughout the year, especially in the central and eastern

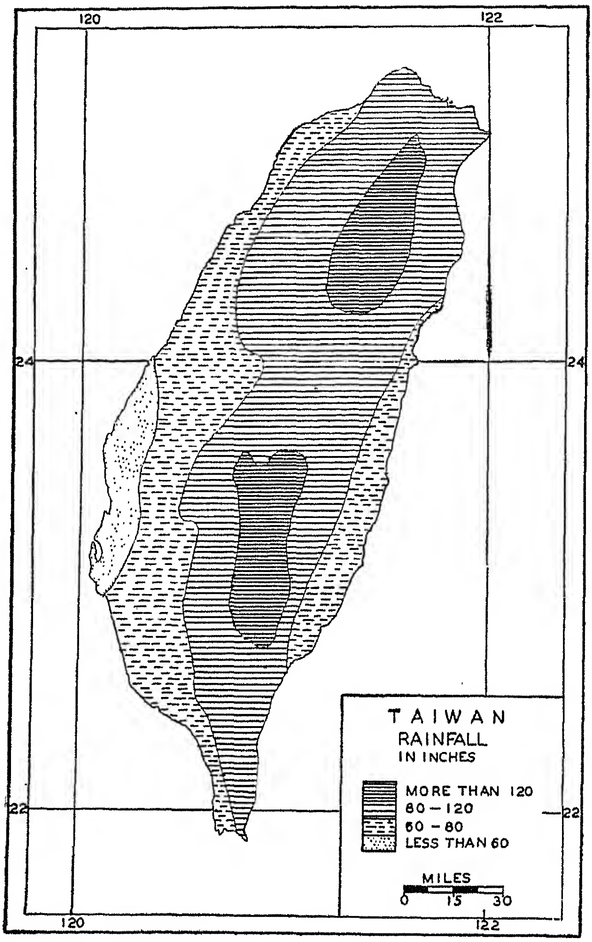

Fig. 151.—Rainfall of Taiwan. (According to the Central Meteorological Observatory, Tokyo, Japan.)

highlands, in which the greater part shows records of more than 80 inches of rainfall per annum (Fig. 151). The southwestern coastal lowlands, however, receive less than 60 inches of rainfall a year. In general the climate may be classified

as the tropical wet and dry type; and like Cuba, India, and various regions in which this climate is found, Taiwan has become a noteworthy producer of sugar cane, a commodity that yields maximum returns only in a tropical climate that possesses a dry period or periods for the concentration of sucrose content and for harvest.

Climate is a basic factor as related to floral differences in Taiwan. Among the native plants growing in the lowlands, the betelnut palms, pandanus, bamboos, and tree ferns are noteworthy, while mangrove swamps are found in the shallow waters adjacent to the southern coast. Luxuriant forests cover the greater part of the central and eastern highlands. Here, especially at lower elevations, the camphor tree reaches its greatest development and accounts for the island's unique place in supplying the commercial world with camphor. The higher altitudes of the mountains possess beautiful forests of conifer trees (especially species of Chamaecyparis), which at still higher levels give way to short grasses.

Agriculture.—In Taiwan agriculture is the dominant activity and the chief source of wealth. It engages the greater part of the island's 4,594,000 people (1930) and reaches its maximum development in the western lowlands, especially in the plains that extend from Taichu to Takow (Takao). The crop land is given mainly to rice, sugar cane, tea, jute, plantain, tubers, and pulses.

Grown in all of the physical divisions of the island, rice is the mainstay of the population. Most of the crop is produced in the western lowland, and here the quality has been improved considerably by the introduction of high-grade seed from Old Japan, and by government aid in irrigation. At the present time the rice output of the island reaches a total of approximately 30,000,000 bushels per annum. Of this amount approximately 16 per cent goes to Japan proper, the greater part of it coming from the lowlands adjacent to and south of Taichu (Taityu). Two crops are produced a year in many districts of this tropical island.

Sugar cane and tea.—Taiwan has made notable progress in the production of cane sugar, as reflected in an output of 847,000 short tons in 1930, and this industry appears to be the most prosperous of the island's recent developments. It is

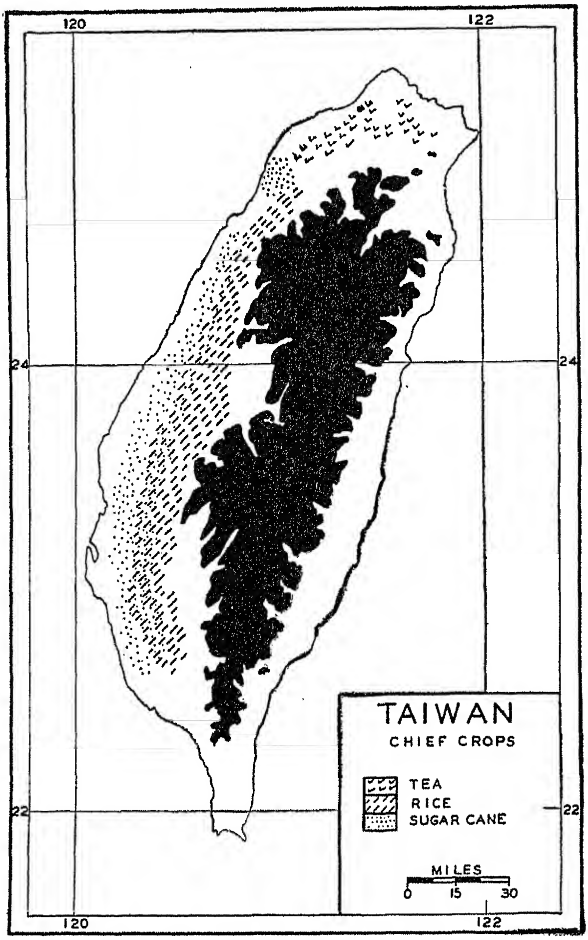

Fig. 152.—Generalized map showing major areas of concentrated production of rice, sugar cane, and tea. Area in black shows lands above the 3,000-foot contour.

concentrated in the western plains, especially to the south of Taichu, and in front of or to the seaward of the major rice producing unit, with a secondary area of concentration in the northwest near Shinchiku (Fig. 152).

At first a highly neglected industry, suffering from inefficient methods and poor varieties of cane, the cane sugar business has made rapid strides in recent years under government stimulation. Foreign varieties of cane have been introduced: at first the Hawaiian Rose and Bahina varieties, and later high-yielding Javanese cane. Although the Taiwan plantations show abundant yields per unit area, they do not compare favorably with the sugar-producing districts of eastern and central Java, where yields are even higher and wages lower than those of Taiwan. Hence, on the basis of comparative costs, the Javanese sugar costs from fifty to seventy-five per cent less per unit of output.

Tea is normally one of the major exports of the island. Unlike rice and sugar cane, which reach maximum development in the western districts, tea is grown mainly in the northwest, especially in the area stretching from Shinchiku to Taihoku (Fig. 152). In recent years large tea plantations have been further extended to the east of Taihoku into the highlands of the aborigines. The Taiwan teas (Oolong and Poochong) are considered to be superior in quality to black teas. Oolong tea is, in fact, a great favorite in various markets, especially in the eastern seaboard districts of the United States and in Great Britain, where it is used to improve the flavor of black tea.

Other crops.—Many other crops are grown in this tropical island. Noteworthy among these are bananas, tubers, pulses, and some jute. The banana production has developed rapidly in recent years, and bananas are now among the leading items of export. Most of these are sent to Japan proper. As in other parts of the Orient, beans and peas are widely grown and provide the necessary protein in a land where there is a paucity of livestock.

Forest products.—Taiwan possesses large forest reserves, especially in the interior highland regions. Here camphor, pines, and various hardwoods are of greatest commercial importance. Lumbering developments have been realized in some districts, especially in the highlands east of Kagi, but the all-important timber product of Taiwan is camphor. As

a native plant of the island, the camphor tree (Cinnamomum camphora) is widely distributed and flourishes up to elevations of 3,500 feet, with some of the most valuable areas located in highland districts occupied by aborigines. The commercial product is obtained from the wood and bark of this tree and enters the foreign trade in the form of camphor and camphor oil.

Mineral exploitation.—Although Taiwan produces a variety of minerals, these are utilized mainly by the local population, with coal and ores entering the export trade. Coal is obtained chiefly in the northern part of the island, especially in the districts adjacent to Kiirun (Keelung), which produce good bunker coal. Other minerals of importance include gold, salt, copper, sulphur, building stones, and petroleum. Placer gold is obtained from various places, including the Shinjo district on the east coast and the valleys of the Keelung and Zuiho rivers. As a Government monopoly, salt is very important locally and is produced mainly by evaporation of sea water. The domestic trade in this commodity extends throughout the island and provides a desirable means of contact with the aborigines of the interior.

RYUKYU ISLANDS

Natural environment.—Located on the eastern edge of the East China Sea, the Ryukyu Islands extend from Formosa to the island of Kyushu. This group of fifty small islands has a total area of 935 square miles.

Most of the islands have a rugged relief. The large islands of Okinawa and Ishigaki, which are located in the middle group, are very mountainous in character. The western islands of the archipelago contain active volcanoes, and constitute part of a larger system of volcanic ranges which stretch northward to Mt. Kirishima of Kyushu and southward to Mt. Taiton of Formosa.

The climate of the islands reflects the moderating influence

of the surrounding waters. At Naha, in the middle of the archipelago, the average temperature for the coldest month is above 58°F., whereas the mean monthly temperature during August is 82.5°F. The mean monthly range in temperature is therefore considerably less than that of Kyushu and Shikoku, the southern islands of Old Japan. There is, however, some climatic diversity within the islands by reason of their latitudinal extent (489 miles). In addition, the southern islands get the direct influence of the warm Kuro Siwo. Cloudy skies, abundant rainfall, and frequent typhoon storms are other important features of the climate of the Ryukyu Islands. The rainfall at Nahu is approximately 80 inches a year.

Tropical cyclones or typhoons cross these islands as they pass westward to the coast of China and northward to Japan and Chosen. Heavy rainfall is frequently associated with the passage of tropical cyclones, and violent winds cause considerable damage. Houses are constructed of light, inexpensive material (straw-thatched) so that they may be rebuilt at small cost. Since these storms are most frequent in occurrence during the summer and fall months, the destruction to crops is considerable. With this natural handicap the inhabitants are unable to maintain a high productive capacity.

Tropical forests cover approximately 60 per cent of the land. These are most extensive in the highlands, whereas the lowlands contain a number of tropical fruit trees, such as the banana, the papaya, and the date palm. Among the trees of the highlands, one will find the camphor tree, the redwood, the ebony, the red sandalwood, and the Okinawa pine. Wasteful timber exploitation in the highlands has caused erosion, deep gullying, and loss of soil on the hillsides. Cycads are being planted in areas most subject to destructive erosion.

Agricultural industry.—Agriculture is the chief source of wealth, with seventy-five per cent of the inhabitants engaged in that occupation. Miniature holdings characterize the agricultural economy. In fact, the average family has but 1.9 acres of cultivated land, as compared with 2.7 acres in Japan proper.

Moreover, 68 per cent of the agricultural land is owned by independent farmers. The tenant system, therefore, has not become as widespread as in Japan proper.

Sugar cane and sweet potato as chief crops.—Unlike Japan proper, where rice is the dominant crop, the Ryukyu Islands have rice on but 12 per cent of the cultivated land. On the other hand, 40 per cent of the crop land is devoted to the sweet potato, the staple food of the inhabitants, which is consumed as flour and used in the making of alcoholic drinks.

Just as the sweet potato is the staple crop of the islanders, so sugar cane is the cash crop. Seventy per cent of the farmers grow some cane, and the exports of cane sugar constitute 59 per cent of the total value of all merchandise exports. The sugar cane industry, however, suffers from primitive methods with regard to the growing, transporting, and processing of the cane. In addition, better methods of fertilization and the selection of better sugar cane have been recommended.[1]

Other economic activities.—A small-scale livestock industry and the growing of vegetables add to the economic pursuits of the agricultural classes. The raising of vegetables during winter appears to have possibilities for future development.

The off-shore waters abound in fish, yet this resource has been but little utilized. The tropical forests are being exploited in some districts, whereas mineral resources are of little importance.

CHOSEN (KOREA)

Significance of the country's location.—As the seat of one of the ancient civilized kingdoms of the East, Chosen rivaled the early splendor of China. Various elements of her past civilization are even to be found in the social and economic fabric of Nippon. The peoples of Chosen remained for centuries in essentially a state of seclusion, and the country has been called the "Hermit Kingdom." Internal evolution of culture reached

[1] Uyehara, Yukuo: "Ryukyu Islands, Japan," *Economic Geography*, Vol. IX (1933), p. 403.

relatively high planes of development, and it is generally believed that Japan has borrowed freely and incorporated the elements of this culture. Japan reflects such borrowings in her

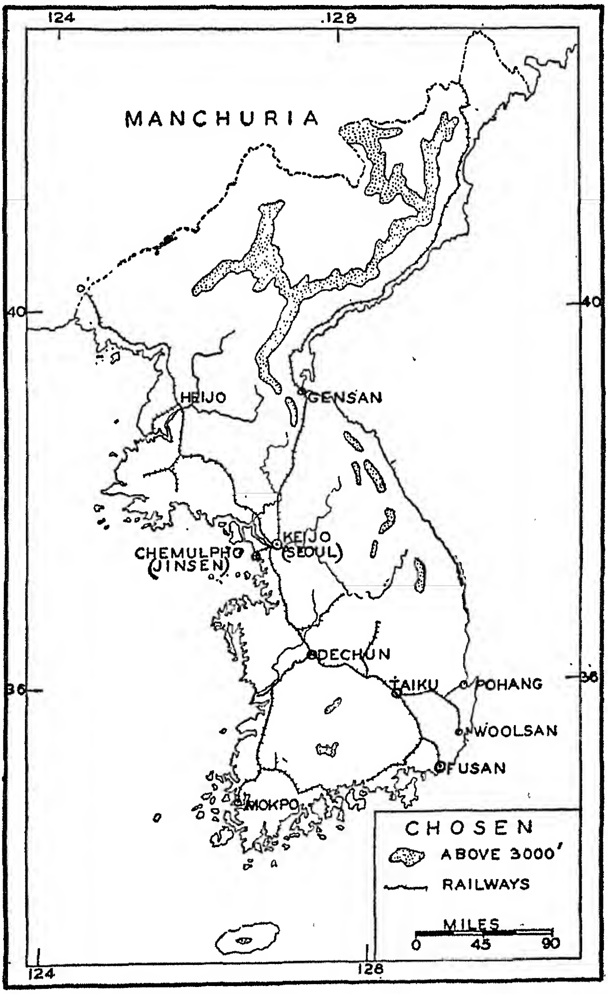

Fig. 153.—Major railway lines and some of the chief cities of Chosen.

religion, language, customs, and the arts of printing, painting, weaving, and sericulture. Yet within the last few centuries the government of Chosen has been corrupt and the people backward. Hence Chosen, like China, progressed but little, while

the nations of the Occident have made phenomenal advancements.

By reason of large size, varied resources, and location with respect to Chinese, Japanese, and Russian spheres of political influence, Chosen has long been considered an important geographical base by these contending Asiatic countries. Japan established a protectorate over the Hermit Kingdom at the beginning of the present century, and finally (1910) annexed this peninsula as a major Japanese colony.

Physical features.—With an area of 85,000 square miles, Chosen comprises a mountainous peninsula which is 600 miles long and 135 miles wide, the longer axis trending north and south. Separated from Manchukuo by the natural boundaries of the Changpai Range and the two large streams, the Yalu and Tumen, Chosen has various distinctive features in its topography. The greatest highland development is in the north, where volcanic as well as sedimentary rocks are widely distributed. This northern region contains the gigantic volcano called Hakuto-san or Paik-to-san, which contains a large crater lake (Dragon King) on its summit. Among other highland features of this northern region is the plateau of Kaima, the surface of which is covered with lava flows from Hakuto Volcano. In various places these lava flows of the plateau have been dissected into a number of mesas. Farther south, Chosen possesses many tilted mountains which trend mostly in a meridional direction. Among these, Tai-Bak-San and Keumkang San are noteworthy, since they form the backbone of the peninsula. A rift valley crosses the neck of the peninsula from Keijo to Gensan. Here basalt eruptions have covered the surface of the valley with lava, thereby making a long plateau which is used by present Keijo-Gensan railway (Fig. 153).

The lowlands of Chosen are found mainly in the western and southern parts of the country. These areas contain the large river plains, such as the Yalu, the Chung Chun, the Daidong, the Han, the Keum, the Sumjin, and the Nakdong. The southernmost of these plains areas constitute the most densely pop-

ulated lands of Chosen. On the other hand, the eastern lowlands are narrowly limited in extent (Fig. 154).

The western plains are highly broken in character along their seaward margins and contain many excellent harbors, whereas

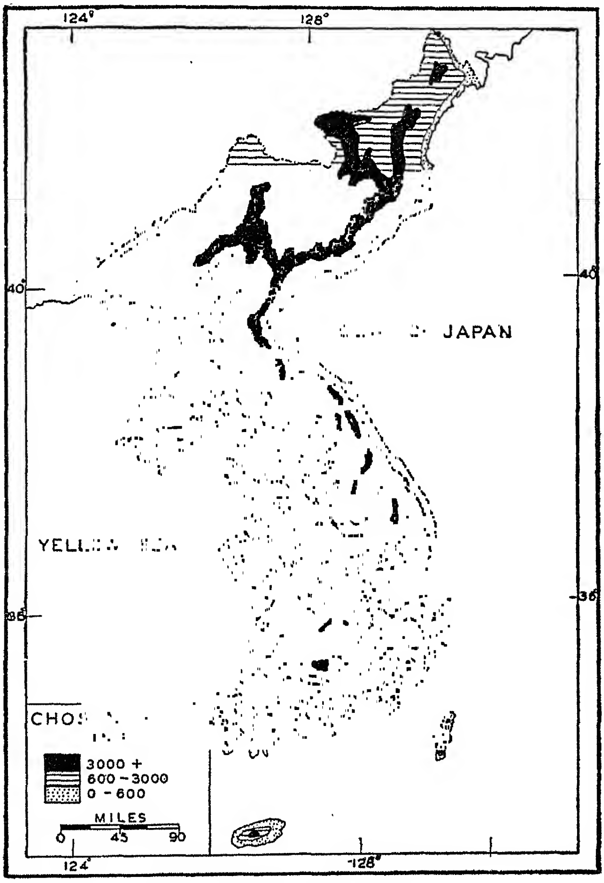

Fig. 154.—Relief of Chosen.

the eastern coast is essentially uniform and lacking in good harbors. But high tides are experienced on the western coast, thus making it difficult to fully utilize the great number of excellent harbors of that region. It should be further emphasized that a paucity of good harbors along the eastern coast and high tides along the broken western margins of the country militat-

ed against easy contacts with other lands and were, therefore, responsible in part for the isolated, inaccessible position of the Hermit Kingdom.

The climate.—The climate of Chosen is affected by: (1) leeward position on the Asiatic mainland; (2) latitudinal extent; (3) the monsoons of Asia; and (4) the adjacent waters. Chosen's position on the continental land mass of Asia corresponds roughly with that part of the United States which stretches from southern North Carolina to Maine. The latitudinal extent of approximately 600 miles explains the difference in temperatures between southern and northern parts of the country. Yet all areas are affected by the monsoons of Asia, and have therefore a pronounced seasonal climate. The seasonal extremes, however, are not as great as those of corresponding lands (in latitude) in north China and Manchukuo, chiefly because of the peninsular position of Chosen. The precipitation for the country as a whole is approximately 36.3 inches a year. The rainfall is therefore much less than that of Old Japan; and where rice culture is the rule, irrigation is more urgently needed than in the latter country.

Chosen has three well-defined climatic types. The greater part of the peninsula has the humid subtropical or so-called "Cotton Belt type." Here the winter temperatures are higher than in other parts of the country, making possible a two-crop agricultural system, which resembles that of the Old Japan and the Yangtze Basin of China. Northern Chosen contains two types of climate—the humid continental, with long summers, and the modified humid continental. The climate of northwestern Chosen resembles that of north China and Manchukuo, and may be classified as the humid continental type with long summers. The northeastern coastal region has an abundant snowfall during winter. Its climate is similar in various respects to the climate of New England and may be classified as modified humid continental.

The agricultural industry.—In Chosen agriculture has had a long history, and the Koreans today are dependent chiefly on this occupation for their livelihood. Approximately 85 per cent

of the total population may be classified as rural. Twenty per cent of the total area of Chosen is cultivated land, which is devoted mainly to crops that will feed the local population. In addition, there is an exportable surplus of agricultural foodstuffs and raw materials.

The utilization of the agricultural land is not the same throughout Chosen, and a number of agricultural subdivisions should be recognized. A scattered small-patch agriculture characterizes the northern highlands and the mountainous backbone of the country. Wheat, beans, millet, and barley are the chief crops. Rice enters the agricultural economy of these highland regions only at relatively low elevations in mountain valleys, chiefly in the south. The northeastern and northwestern coastal regions are characterized by a one-crop system; that is, crops are sown during spring and early summer, although to a limited extent fall-sown wheat enters the cropping system in some districts. Wheat, beans, millet, and barley are important crops also in these coastal regions. Rice is grown in some parts, but nowhere does it occupy as dominant a rôle as it does in the southern parts of the peninsula. South of Keijo or Seoul in the west coast region, rice is the most widely cultivated crop. Here it is grown with the aid of irrigation in a two-crop system of agriculture, which is quite similar to the cropping system of humid subtropical parts of Japan and China. After the October rice harvest, large areas of paddy land are given to wheat and barley.

In the western two-crop region of Chosen, cotton has become an important summer crop. This region produces the greater part of the country's cotton crop of 150,000 bales. The most noteworthy development of Chosen's cotton industry followed the introduction of American upland varieties, which give excellent returns. Moreover, the humid subtropical climate favors production, and the growing cotton textile industry of Japan constitutes a good market for this raw material.

Just as southwestern Chosen is the distinctive cotton producer of the country, so the southeastern region is important for its sericulture. This industry has gravitated mainly to the

Nakdong River Basin and adjacent lands (Fig. 155). Located near Japan proper and connected by rail with other parts of Chosen, the Nakdong Basin occupies a favorable geographical position with regard to the development of sericulture. As in

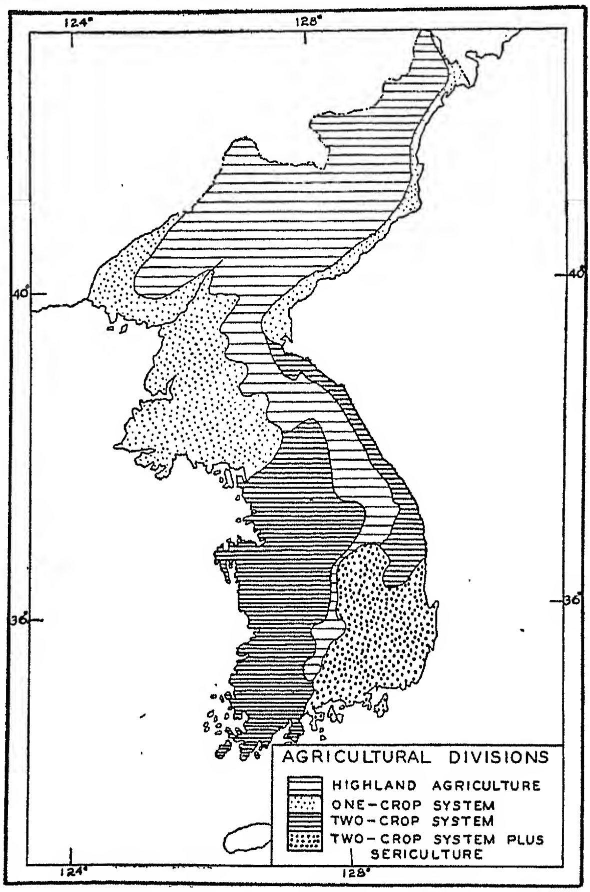

Fig. 155.—Agricultural divisions of Chosen.

Old Japan, the climate of the region favors the growth of the mulberry. Rice, however, is the most widely cultivated crop, and is generally grown in a two-crop system in which wheat and barley occupy the land during the winter half-year. This combination of two-crop agriculture and raw silk production

has made possible a population density of more than 250 per square mile of land.

Natural resources.—As has been stated, the soil is the most important natural resource of Chosen. In addition, the country draws upon its forests, minerals, and off-shore waters. An important fishing industry has developed in the east-coast region of the country. In the northwest, chiefly in the Yalu River Basin, timber is cut every year. Pulp and lumber mills have been located at the mouth of this river. Here the chief type of commercial timber is larch. Careless exploitation has characterized the industry in the past, and a forest conservation program has been recommended.

Of the mineral resources, iron, gold, and coal are most important in point of value. These are mined chiefly in the northwestern part of the country. Iron ore obtained from the Seinei and Inritsu districts of northwestern Chosen has long been exported to the Imperial Steel Works in Yawata, Japan. At the present time iron ore is smelted at Chinnampo and Kenjiho. Gold is obtained from the highlands east of the Yaku River, whereas high grade coal is mined in the Heijo (Pyengyang) district.

Manufactures and commerce.—The large-scale modern factory system has made but small beginnings in Chosen. The country is still chiefly a producer of foodstuffs and raw materials, which are listed among the leading exports. The home or cottage textile industry is one of the oldest and most important domestic manufactures. At present the textile industry has also developed in modern factories, but home and factory output together satisfies only one-third of the cloth requirements of the country, the remainder coming chiefly from Japan. In southeastern Chosen, silk reeling has become an important business within the last two decades (1910-1930) and gives promise of further growth. In addition, Chosen manufactures a number of commodities, including rubber shoes, sandals, flour, bean cake fertilizer, pig iron, cement, sugar, and salt. With its 21,000,000 people, Chosen constitutes an important market for finished goods. But the purchasing power of

these people is low, and the economic life of the nation is seriously hampered because of poor transportation facilities. A program of improvement making possible a better road system, more sanitary living conditions, conservation of natural resources, and better educational facilities would bring about a marked development in the industrial life of the country.

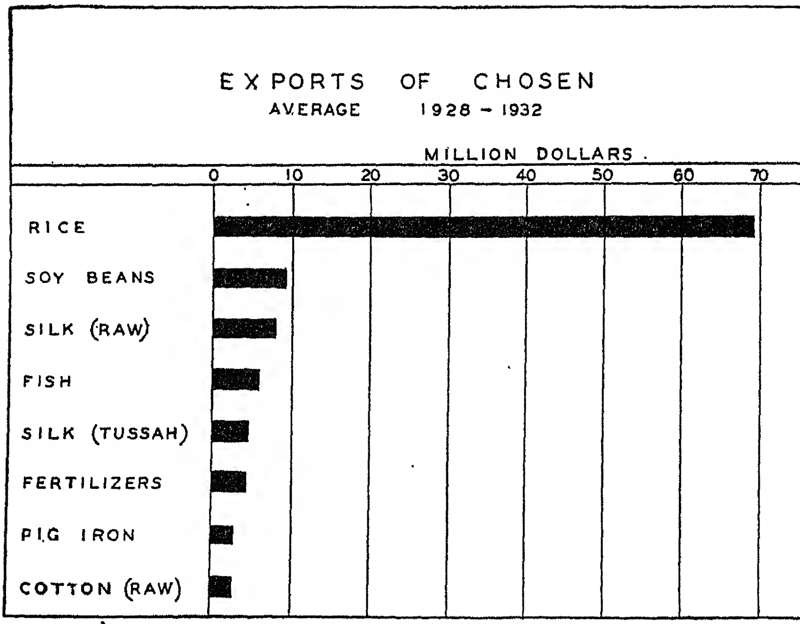

Fig. 156.—Leading merchandise exports of Chosen.

Various kinds of manufactured goods are obtained from foreign countries, chiefly cotton textiles, clothing, and machinery. In order to pay for these, Chosen exports rice, soy beans, silk (raw and tussah), fish, fertilizers, pig iron, and raw cotton (Fig. 156). Of these exports, rice is the outstanding item. However, the country also imports some cereals, chiefly millet and wheat. More than 90 per cent of all the exports go to Japan, and more than three-fourths of all imported merchandise comes from Japan (Fig. 157).

KARAFUTO

Physical setting.—The climate and vegetation of Karafuto suggest eastern Siberia rather than Japan. Even in the extreme southern part at Odomari (Korsakovsk), the average annual temperature is only 37.5°F. Northern coniferous forest and tundra projected eastward from Siberia meet in the island of Karafuto. In no other part of the world does tundra extend so far to the south. In fact, scattered nomadic tribes keep reindeer in some districts which correspond in latitude with southern Europe.

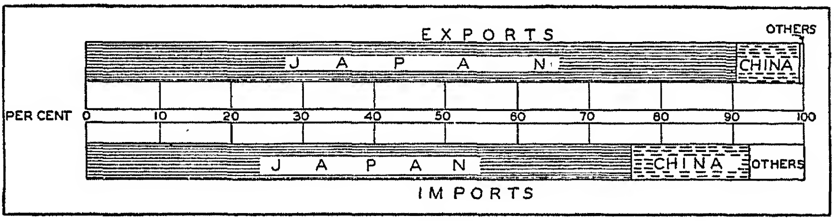

Fig. 157.—Chosen's trade with principal countries in 1930.

Physically, the island may be divided into three well-defined parallel zones that trend from north to south. The western and eastern of these are highland regions. The western highlands constitute the backbone of the island. They are traversed by volcanic rocks in some districts and in other areas contain a number of coal seams. The eastern highland zone consists chiefly of old rock formations. Between the two highland regions, Karafuto contains a central zone of depression—a long north-south trending lowland which drains to the north and to the south.

The people.—The original inhabitants of Karafuto were the Ainus in the south and the Giliaks and Orochons in the central and northern parts. They were engaged in fishing in summer and hunting during the long cold winters. The Giliaks, however, were also engaged as pastoral nomads, and possessed herds of reindeer. Later Russian influence became manifest from the west, and Japanese from the south. The Russians called the island Sakhalin, whereas for many years the Japa-

nese have called it Karafuto. The entire island was long a penal colony of Russia, the convicts being engaged in coal mining and in the production of hardy cereals. In 1905 Japan acquired that part of the island which is located south of 50° N. This part contains 13,900 square miles of land and has 295,000 people. Japanese immigration has been quite active, and at present these people make up 98 per cent of the total population. Yet this land of low temperatures, tundra, and forest will probably never attract very large numbers of the rice-eating, home-loving Japanese.

Economic life.—In its natural environment as well as economic life, Karafuto resembles Newfoundland. It occupies a comparable geographical position on a major land mass. The fishing industry is the chief occupation of Japanese Karafuto. When the fishing season is at its best, the population is swelled by incoming Japanese from Hokkaido and Honshu. Herring, crabs, and salmon are among the chief types of fish obtained in the off-shore waters.

The Japanese also attach major importance to the forest resources of Karafuto, since there are large stands of timber for newsprint manufacture. The pulpwood industry appears to give promise of further development in the future.

Agriculture is handicapped in this area of short, cool summers. Approximately 45,000 acres of cultivated land are devoted to hardy cereals, grasses, and vegetables. Oats, rye, barley, and some spring wheat are the chief cereal crops.

Of mineral resources, coal, iron pyrites, and some petroleum are found in insufficient quantities for any large-scale exploitation. The coal is inferior to that of Russian Karafuto, which contains some of the highest-grade coking coal in the Far East. Petroleum is also more plentiful in the Russian half of the island.

Odomari is the principal port of Japanese Karafuto. It is the terminus of a short-line railway which extends northward through Toyohara to Naibuchi. The provincial capital is Toyohara. On the west coast a short railway parallels the coast and serves the small city of Mauka, which is the center of the

fisheries in the Gulf of Tartary. Contact with Japan proper is facilitated by a regular ferry service between northern Hokkaido and southern Karafuto.

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CHAPTER XXIII

China—Natural Environment, Population, and Agriculture

The geographical base and resources.—With its vastness and variety, its distinctive natural and cultural features, its teeming millions, and its diverse resources, China intrigues the interest of all who are concerned with the contemporary problems of our commercial world. Among Asiatic countries, its area is second only to that of Siberia. Large area is generally a marked asset to a country, owing to the great and varied production of wealth of which it is capable. In addition, a large, diversified geographical base capable of producing much wealth is a major influence in the sustenance of a large population, and the human agglomeration of China comprises approximately one-fourth of the inhabitants of the world.

Not all of China, however, is equally capable of supporting large numbers of people, and the population map shows an irregular distribution (Fig. 158). Here fertile valleys, basins, plains, and the lower slopes of adjacent highlands constitute areas of concentration. Kiangsu has a population density of more than 800 people to the square mile, Kansu (northwest China proper) has less than fifty, and the figure drops to less than two people per square mile of land in extensive areas of Sinkiang, Mongolia, and Tibet. Such differences in population density are related closely to the diversity in the geographical base—the abundance of valuable resources in some areas and the handicaps or disadvantages in the physical setting in other parts of the country. As related to resources utilizable under existing conditions, China is capable of maintaining its population and can care for even greater numbers of people. But any appreciable increase in the standard of living and in the

general cultural plane of the Chinese would necessitate smaller numbers, and in this sense China is overpopulated.[1]

The cultural landscape and its development.—The present cultural landscape of China has developed under diverse conditions of natural environment. But the cultural forms and pat-

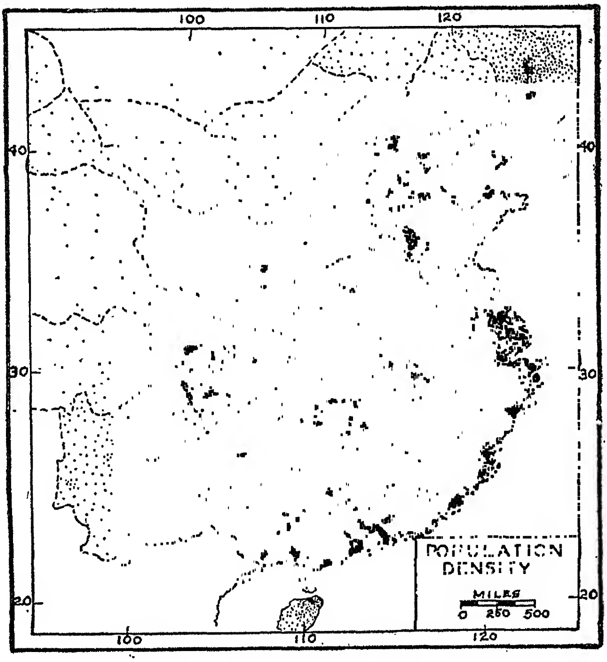

Fig. 158.—Population density in China. Each dot represents 25,000 people.

terns which have evolved in these diverse settings are explainable not only in terms of natural features, but also in terms of racial characteristics, historical antecedents, and various other factors. These cultural patterns have evolved through the course of time and as a result of considerable reshaping of the geographical base in many districts, and are therefore the product of centuries of development by a people whose origin may be traced back to very ancient beginnings. There is a close bond between man and the natural environment. Here the tiny, intensively cultivated fields, the character of the dwell-

[1] See the excellent text prepared by Cressey, G. B.: *China's Geographic Foundations,* McGraw-Hill Book Co., New York, 1934, pp. 17-24.

ings, and the great direct dependence of peoples on the natural environment suggest the term "biophysical unity" as being quite applicable to the Chinese landscape.[2]

Although the origin of the Chinese people is not known with certainty, it is believed by various scholars of this problem that they trace back to peoples who came from central Asia and apparently settled in the valley of the Wei Ho, from which they have spread into other parts of the country.[3] In this tributary of the Hwang Ho, civilization made its appearance, according to the best authorities, sometime between 2,500 and 3,000 B.C. These early settlers of the Wei Ho are believed to have come from the irrigated districts of inner Asia—probably the Tarim Basin—where they long practiced crop production, and therefore transplanted to their new homes the elements of an advanced culture. They were apparently settled agriculturists rather than pastoral nomads, and reflected the Bronze Age type of civilization.[4]

From such beginnings the cultural landscape of China developed, and throughout the history of the country one finds the agricultural features as the most significant part of this landscape. Although changes have taken place, any great change has resulted from cultural borrowings from the outside rather than internal evolution. The Chinese had developed a culture pattern which was relatively rigid, crystallized, and inelastic. Escape from the old hardened routine, therefore, came only with stimuli from the outside. But the Chinese lacked widespread contacts during the greater part of their history, the result of which is reflected in the country's present economic, political, and social development.

China's geographical location.—In studying the development of peoples and nations, we note the importance of favorable geographical location, which together with abundance and variety of material resources determine in large measure the

[2] *Ibid.*, p. 1.

[3] Bishop, C. W.: "The Rise of Civilization in China with Reference to its Geographical Aspects," *Geographical Review*, Vol. XXII (1932), pp. 617-631.

[4] Bishop, C. W.: "The Geographic Factor in the Development of Chinese Civilization," *Geographical Review*, Vol. XII (1922), pp. 19-41.

ultimate greatness of a country as a political power. By reason of its location chiefly in the temperate zone, its long irregular coast line, and its vast area with diverse resources, China occupies a strong position in the Far East. But location which today is considered quite accessible was highly unfavorable in her early history, when transportation facilities were poorly developed. Thus the isolation of the Chinese was a factor of major importance in their past history and economic growth. These people have evolved in an area that was quite effectively shut off from other important centers of civilization by barriers of desert and steppe, mountain and sea. Thus confined to a limited area, protected from without by natural barriers, the Chinese population increased rapidly and the civilization became relatively fixed and inelastic, depending upon outside stimuli for any notable modification or change.

Location on the Pacific was of little advantage in giving the Chinese contact with distant lands. The small Chinese boat could withstand no long ocean voyages. To reach the Indian civilization at Calcutta meant an ocean voyage of approximately 3,500 miles from Canton, China; and the Pacific Coast of North America, which was even more remote, had little to offer the ancient Chinese. Before the time of large sailing vessels and steamers, the oceans were among the most effective natural barriers to widespread contacts.

Contact by land was equally difficult. Although caravan routes spanned the vast stretches of central Asia, they extended through desert steppes and mountains, and stretched through many inhospitable regions. Travel by land was associated with many difficulties, involved much time and delay, and resulted in exhorbitant transportation costs on commodities that were obtained from distant lands. Even today China's land contacts with remote areas are relatively unimportant, as reflected in the small trade relations with various of the western parts of her own domain.[5]

The early Chinese, developing in the great basins of China

[5]Roorbach, G. B.: "China—Geography and Resources," *American Academy of Political and Social Science, Publication No. 652* (1912), pp. 130-132.

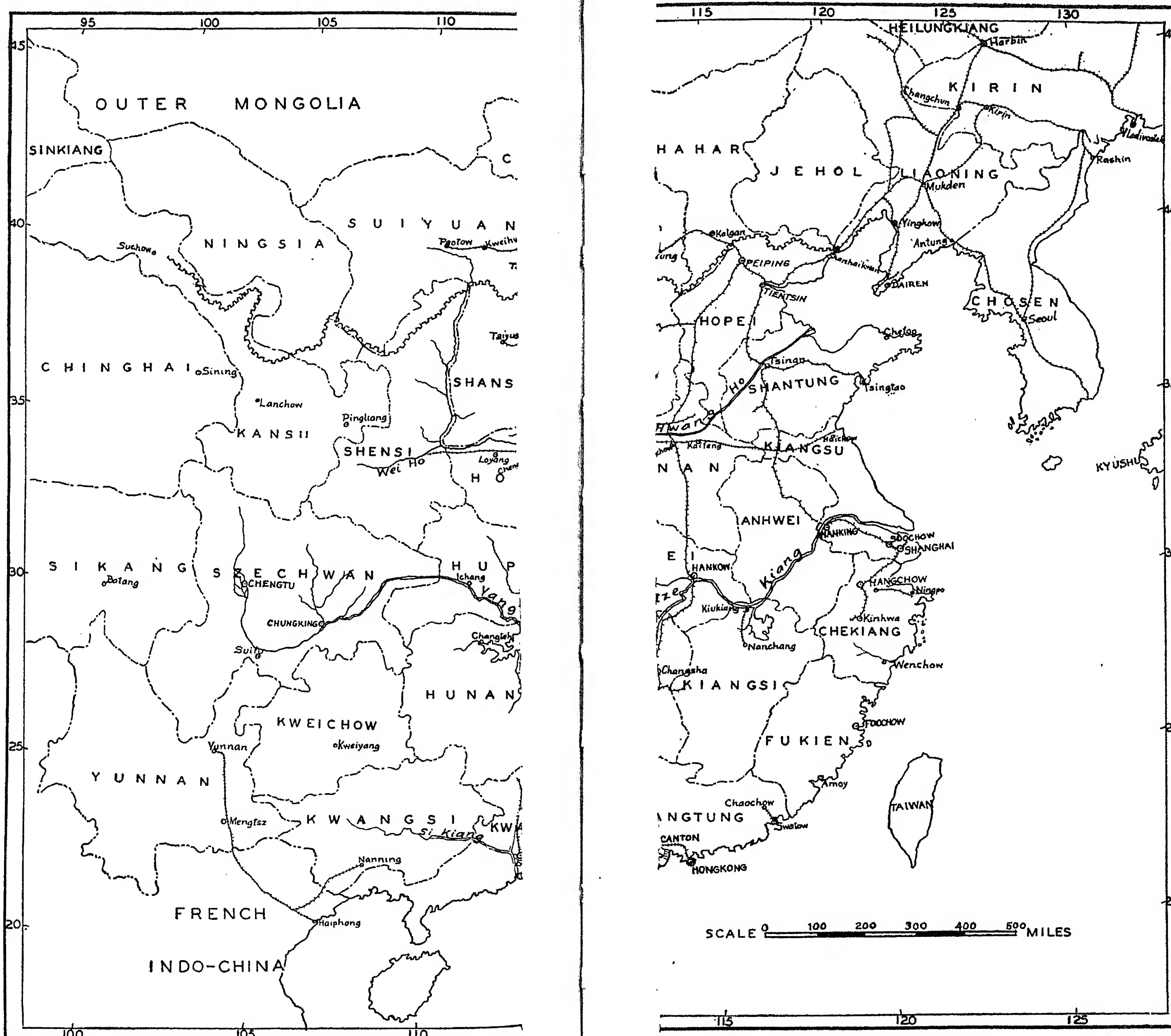

Fig. 159.—Map of China showing provinces, cities, railways, and major waterways.

proper, were subject at times to the inroads of the nomads of central Asia. When the pastures failed, the nomad's stock and family starved; and like pastoral nomads of other lands, he plundered the more fertile tributary lands. Especially marked were his plunderings along the border of Mongolia and northwest China proper, where the relief of the land made his travel less difficult than in the highland areas to the south. In order to protect themselves against the nomadic hordes of the great deserts and steppe lands, the agricultural Chinese finally built a long artificial barrier, the Great Wall.

Diversity of physical features.—The land forms of China are varied in character, and these in turn provide a diverse geographical base for human activities. The high mountain, the broad plateau, the low alluvial plain—all necessitate differences in human activities in order that mankind may make the best use of the natural environment. Thus the nomads of Mongolia and Turkestan, the cliff dwellers of the loess highlands of Shansi and Shensi, the rice and tea growers of the Yangtze and Si Valleys suggest economic differences that may be traced to differences in the physical features of these regions.

In the large, densely populated part of the country commonly called China proper, the controlling relief features are the river basins and plains. They have ever functioned in an important way in the development of the Chinese people. They comprise the most densely populated areas of the country, and one of them—the Wei Ho Valley—is considered the "cradle of the Chinese civilization." In the north the Hwang Ho or Yellow River has formed an extensive lowland in which teeming millions of Chinese have made their home. This river and the sea into which it flows get their name from the great quantities of yellow silt which is found in them—materials carried from the loess highlands of Kansu, Shansi, and Northern Shensi. Farther south, and occupying an area that is often referred to as central China, is another east-west trending valley, formed by the Yangtze Kiang, the longest and most important of the Chinese waterways (Fig. 159). Like the Hwang Ho, it rises in the highlands of Tibet, and it is to China what the Ganges is

to India and the Mississippi is to the United States. Its basin contains a greater number of people than may be found in any other of China's geographical regions. Its important units comprise the Red Basin of Szechwan; the extensive Yangtze lowlands, in which the Wu-Han cities (Hankow, Hanyang, and Wuchang) are located; and the Yangtze Delta, in which Shanghai has developed. To the south of the Yangtze lies another of China's well-known east flowing rivers, the Si Kiang, at the mouth of which one finds Canton, one of the country's large commercial centers. The basin of the Si is often referred to as south China.

Although China contains vast areas of lowland, the rugged highlands—mountains and plateaus are the most extensive of her land forms. In some places the highlands flank the river valleys; elsewhere they constitute natural divides between lowland regions. In north China the more important highlands comprise the loess highlands, located in the western part of the Hwang Ho Basin, and the mountains of Shantung, and Jehol in the eastern part of this basin. South of the loess highlands and the north China plain lies the central mountain region, which separates the former areas from the Red Basin and the lowlands of the Yangtze Valley. In this mountainous region the Tsinling and Hwaiyang ranges are noteworthy. The barrier characteristic of this region has suggested the separation of China into a northern and a southern part. This division of the country is further strengthened on the grounds of a corresponding cultural and, at times, political division of the country.[6]

To the south of the Yangtze Basin one finds a highly broken topography, consisting mainly of hills and intervening valleys. In the provinces of Hunan and Kiangsi this hill-country drains into the Yangtze River and is known as the "south Yangtze hill region," whereas farther to the south the hills of Kwangsi and Kwangtung make up the major part of the Si Kiang Basin. West of this basin the land rises in elevation and com-

[6] Bishop, C. W.: "The Geographic Factor in the Development of Chinese Civilization," *Geographical Review,* Vol. XII (1922), p. 20.

prises extensive tablelands in the provinces of Kweichow and eastern Yunnan. The degree of relief becomes greater as one proceeds into southwestern Yunnan, and here are found the upper parts of the Mekong and Salween—rivers that give access to peninsular Indo-China. Along them the civilization of southern Asia has spread northward.

West of China proper lie lofty plateaus, extensive mountain ranges, and interior basins. The plateau of Tibet is the largest high plateau in the world (14,000 to 17,000 feet above sea level). To the north of this plateau are found extensive mountains—Kunlun and Altyn Tagh. Northward beyond the eastern extension of these highlands the land drops quite abruptly to the desert of Gobi, where the average elevation of the land is only 4,000 feet above sea level. On the other hand, the land located north and west of the Kunlun ranges comprises a great depression, which contains the Tarim Basin. This arid region is characterized by an interior drainage system and has an average elevation of 3,000 to 4,000 feet, except in the district of Lop Nor, where the elevation is less.

In summary, a study of China's land forms discloses the following classification of major physical units.[7] North China embraces: (1) the great plain of north China; (2) the highlands of Shantung and Jehol; and (3) the loess highlands. Central China comprises: (1) the central mountain region; (2) the Yangtze lowlands; and (3) the Red Basin of Szechwan. The physical units of south China include: (1) the hill region of the south Yangtze Basin; (2) the southeastern coastal region; (3) the Si Kiang lowlands; (4) the hills of Kwangsi and Kwangtung (Hills of Liangkwang); and (5) the mountains and plateau of Yunnan and Kweichow. In the less important, more sparsely populated parts of the country lie: (1) the high extensive Tibetan Plateau with associated mountain ranges; (2) the lofty plateau of Pamirs; (3) the Tarim Basin with its

[7] Since Manchukuo will be treated separately in this text, the physical divisions of that area will be omitted at this point.

adjacent mountains; and (4) the broad central Asiatic plateau in which Mongolia is located.[8]

Climate.—Like location and relief, climate is one of the unchangeable and persistent factors of the natural environment.

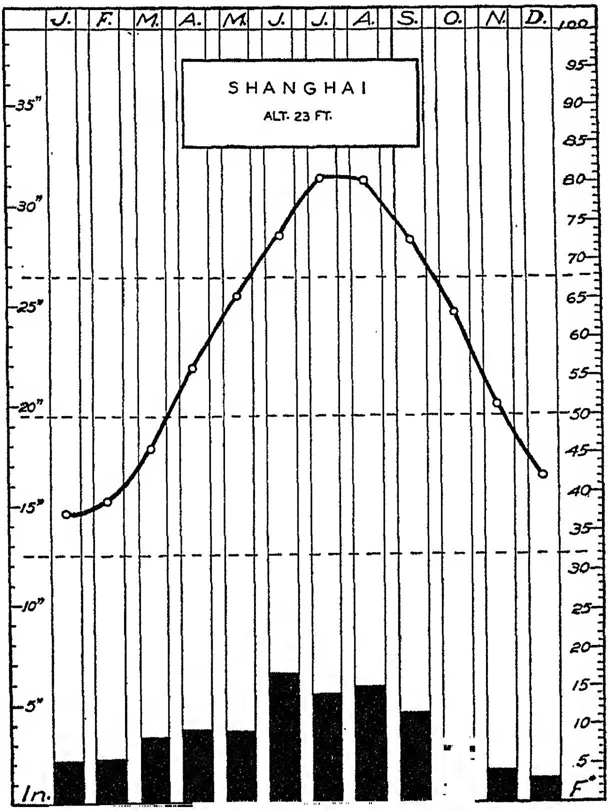

Fig. 160.—Average monthly temperature and rainfall conditions in Shanghai, China.

In China the diverse physical base is matched by a diversity in climate, but there is nevertheless a unifying influence caused by the monsoons—summer rains and relatively dry conditions during winter. During the winter months—October to April—

[8] See Richard, L.: *Comprehensive Geography of the Chinese Empire,* Tu-se-wei Press, Shanghai, 1908, and Cressey, G. B.: *China's Geographic Foundations,* McGraw-Hill Book Co., New York, 1934.

the monsoon of central Asia blows from the dry, cold regions of Mongolia and Siberia toward a region of low pressure in the Pacific Ocean. These winds bring cold and little or no moisture. But with the heating of the earth's surface as this part of the world is brought close to the sun during summer, the region of low pressure shifts in May and June to central Asia and the monsoons change in their direction, blowing inland from the Pacific and bringing heavy rains—first to south China (May and June) and later to north China (July and August). Thus rain falls at the time of greatest heat and when plant growth is most vigorous (Fig. 160). The change from summer to winter is pronounced, but it is less marked in the southern and central provinces than in the northern part of the country. Moreover, the seasonal extremes are noteworthy, being greater than those in corresponding latitudes in North America and Europe.

The monsoons, however, are more intense some years than others. During some years the monsoonal currents flow rapidly into the interior land mass of Eurasia and bring an abundant supply of moisture, whereas other years suffer from weakened monsoons and a deficiency of rainfall. Such fluctuations in rainfall bring disaster to the agricultural industry because of the frequent droughts and floods. Thus famines are common in this densely populated country where but little is stored for the periods of dearth.

The irregularity in rainfall both as to amount and time of occurrence is the chief controlling factor in determining the agricultural production and the well-being of the millions of Chinese. It is the uncertain factor of the natural environment. It is little wonder that the superstitious Chinese, who have closely observed and deified all the elements of the physical environment, should, out of fear, attempt to appease the demons who cause droughts and break dykes. The people, as a result, resort to innumerable superstitious practices in their efforts to break droughts or flood conditions.

This irregularity in climate from year to year and from season to season is constantly modified by cyclonic and anti-

cyclonic storms, which in their general meteorological characteristics are similar to the highs and lows that move across North America and Europe. Some of these storms, in fact, are known to come from the western part of Eurasia, although the points of contact are somewhat obscured by reason of the lack of weather stations in most parts of central Asia. Many of these storms make their first appearance along the central parts of the Yangtze and Hwang Ho Valleys and move eastward to the Pacific. Indeed, some of them cross the latter body of water and appear in western North America. The importance of cyclones and anticyclones should not be overlooked, although they are generally smaller and less intense than the storms which cross Europe and North America. As in the latter areas, so also in China, they constitute the basis of weather forecasts. Precipitation is generally associated with the southeastern quadrant and the seaward front of the cyclonic storm, and during the summer season inflowing air currents of the cyclone are further strengthened when they move together with those of the summer monsoon.

Mention should also be made of the tropical cyclones, known as typhoons in this part of the world. These bring copious rains, at times destructive in character, to the coastal regions of southeastern and eastern China. Originating in the Pacific to the east of the Philippine Islands, the typhoons are relatively small in areal extent, have steep barometric gradients, and some have wind velocities of more than 140 miles per hour. These concentrated storms enter the eastern coastal regions of China at the rate of eight or more per annum. These begin to enter the southern coastal areas, such as the coastal districts of Kwangtung, during the spring of the year, move northward with the coming of summer, and generally strike the central coastal areas in July and August. They occur with greatest frequency during the latter part of summer and the first part of autumn. Because of the strong winds and at times the horizontally sweeping rain squalls, typhoons often cause considerable damage to the coastal districts. Some of the damage, however, is indirect in character; as for example, the high waves

which sometimes sweep over the low coastal areas. But the typhoon itself expends its energy very quickly after penetrating a short distance into the land mass. To a certain extent their destructive effects are offset by the copious rains which they bring to the southeastern coastal provinces, and a study of China's annual rainfall discloses decreasing amounts with distance northwestward.

Climatic regions.—The large size and great latitudinal extent of China suggest the presence of climatic diversity. In the south and southeast and comprising roughly the political units of Kwangsi, Kwangtung, and the greater part of Fukien, the climate is characterized as the "south China type."[9] Here the indigenous plants reflect the prevalence of tropical conditions, and the visitations of the typhoon greatly increase the average annual precipitation, which is usually more than 60 inches per annum. It is essentially a tropical wet and dry climate, especially as measured in terms of life responses. The average temperature for January, the coldest month, is over 50°F.

In the vast Yangtze Basin, or central China, is found the humid subtropical type of climate. It is comparable in various respects to the climate of the American Cotton Belt, and like the latter, it is bounded by the humid continental type of climate on the north. Winters are colder than in south China, but the east-west trending Tsinling Mountains that are located to the north of the Yangtze River provide protection from the cold winter winds that come from the plateaus of Mongolia. At Hankow the average temperature for January, the coldest month, is 40°F., and two other months—December and February—show average records of less than 50°F. In the northern part of the Yangtze Basin, however, the mean monthly temperatures normally fall below 50°F. during four months of the year—December, January, February, and March. Precipitation is less than in south China, and decreases with distance northward and northwestward.

The climate of north China is the humid continental type,

[9] See Chu Co-ching: *The Climatic Provinces of China, Memoir,* National Research Institute of Meteorology, Nanking, 1930.

which is comparable in various respects with the climate in the North American Corn Belt. Summers are warm and winters cold. Thus Paoting and Tientsin, located in Hopei Province of north China, have average temperature records during January, the coldest month, of less than 25°F. Various stations in this northern part of China show mean temperature records of 77° to 80°F. during July. Most parts of this climatic region have five months of mean temperature below 50°F. These are the months of November, December, January, February, and March. Precipitation is strikingly concentrated during the summer season, and shows a decrease in amount from south to north and east to west. Fluctuations from year to year cause considerable hardships in this densely populated land, and famines are of frequent occurrence.

China also possesses extensive stretches of arid and semi-arid land. The provinces of Ningsia, Suiyuan, Chahar, and Jehol contain large areas of land where the precipitation is only 10 to 16 inches per annum, and which therefore may be characterized as steppe. Farther northward and westward are found large areas of middle latitude desert climate. Much of Mongolia is desert, and extremes of aridity are found in the province of Sinkiang.

The large Chinese highland areas differ strikingly in their climate. Thus the plateau and mountain ranges in Yunnan have moderately high precipitation records, whereas the plateau of Tibet is for the most part quite arid. Moreover, the great altitude of Tibet causes low average annual temperatures.

The importance of agriculture.—In China agriculture is the dominant activity and chief source of wealth. According to the agricultural estimates published by the Directorate of Statistics of the Nanking Government in 1932, approximately 74.5 per cent of all the households in China are agricultural households, and it is therefore quite probable that some 75 per cent of the Chinese population is engaged in the agricultural industry. In no other country in the world are so many people dependent upon a single occupation. In fact, it is quite probable

that the agricultural population of China is from two and a half to three times the size of the total population of the United States. This agricultural significance of China traces back to ancient beginnings, and the Chinese may in truth be called "Farmers of Forty Centuries."

As compared with other major agricultural countries, China probably is the leader in total agricultural production. It holds a particularly distinctive place in the output of rice, wheat, kaoliang, sweet potatoes, soy beans, millet, peanuts, barley, silk, and tea. According to the Directorate of Statistics of the Nanking Government in 1932, the 10 heaviest yielding crops gave a total return of more than 350,000,000,000 pounds. On the other hand, the livestock industry of China is not comparable with that of leading agricultural producers in the Occident.

It should be further emphasized that although China plays such a distinctive rôle in the total production of foodstuffs, she occupies a minor place in the world commercial production. Crops are grown mainly for the tremendously large domestic market. In fact, the nation is unable to satisfy her local needs, and therefore must import considerable quantities of rice, sugar, and wheat.

Features of the Chinese agricultural landscape.—Although less than 20 per cent of the total area of China is crop land, the agricultural scene is the most impressive of all the landscape features of the country. It is not the mine, or the forest, or the factory, but rather the agricultural landscape which reflects the important aspects of Chinese economic life. Although the culture patterns of this landscape vary from place to place, mainly because of physical diversity, there are nevertheless certain distinctive characteristics of Chinese agriculture as a whole.

The cultural landscape reflects a preponderance of small fields. These are generally quite irregular in shape, but also rather widely scattered, averaging probably a third of a mile or less from the farmstead. These miniature holdings comprise only 3.5 acres (21 mow) of cultivated land per farm house-

hold.[10] The small agricultural plots are commonly interrupted by footpaths, wheelbarrow trails, and canals; and in many districts the burial mounds are a conspicuous feature of the landscape. In fact, various surveys have indicated that grave mounds occupy from two to three per cent of the farm area over large stretches of land in central China, with some localities showing as high as seven to nine per cent.[11] In still other places the cultural landscape reflects irrigation agriculture. For the country as a whole, approximately one-fourth of the total cultivated area (more than 50,000,000 acres) is under irrigation.

Farm houses are generally not distributed as separate units —so common in the United States—but rather occur as miniature agglomerations, clustered together as well as possible into small hamlets. These agricultural holdings reflect strikingly the type of building material which is available locally—a significant consideration in a country which is inadequately supplied with transportation facilities. In north China the typical farm house is constructed of brick or of sun-dried mud reinforced with the stalks of the distinctive general utility crop, the kaoliang. In many parts of the loess highlands, houses are excavated in the loess slopes. In the southern parts of the country, mud, brick, and bamboo are widely employed as building materials.

The small cultivated plots are devoted to various crops, depending upon the geographical region in which these miniature units are located. In the north, where deficient rainfall, lack of irrigation, sandy soils, custom, or a combination of these factors account for the absence of rice, there crops such as kaoliang, millets, wheat, beans, and barley occupy the cultivated land. In the central, southern, and southeastern parts of the country, rice is the important staple in the cropping system, but in these areas also, a variety of crops may be found. More-

[10] According to the Directorate of Statistics of the Nanking Government in 1932.

[11] Cressey, G. B.: *China's Geographic Foundations*, McGraw-Hill Book Co., New York, 1934, p. 84.

over, in many parts of the country, crops are grown during the winter as well as the summer half-year, and the cultural landscape takes on a different expression from season to season. For China as a whole, the total areas of the various crops show that rice, wheat, kaoliang, millet, barley, and corn are leaders in point of acreage.

Livestock enter the Chinese agricultural economy in but a small way as compared with the nations of the Occident. On the miniature Chinese holdings, pigs and poultry are quite numerous, but there is a paucity of large animals. To keep an ox or a cow on a two- or three-acre plot would mean feed for the animal and almost no food for the family. Since thousands of Chinese farm families live on holdings of only one to one and a half acres (cultivated land), the farm livestock situation is quite self-explanatory. But on farms of five to ten or more acres the plowing is quite commonly done by ox or horse power, with practically all of the rest of the work performed by human hands.

Cultivated area and yields.—Although many people labor under the impression that most of China is devoted to crops, such is not in harmony with the facts that have been worked out by various investigators. Indeed, it is probably not far from the truth to say that not more than 17 or 18 per cent of provincial China is under crops.[12] Final confirmation of this fact is possible only after a complete official census has been taken in China. The small percentage of cultivated land is due mainly to the broken, rugged topographic features and the highland character of much of the country. It should be further emphasized that all readily available land is utilized in this nation of teeming populations.

The 58,000,000 agricultural households in China show an average of approximately 3.5 acres of crop land per farm, and this cultivated land is devoted mainly to wheat, rice, kaoliang, millet, pulses, barley, and corn. According to the Directorate of Statistics of the Nanking Government in 1932, wheat ex-

[12] Based on the reports of the Directorate of Statistics of the Nanking Government in 1932.

ceeds rice in total acreage, but the latter crop shows average yields per unit area that are approximately two and a half times as large as those obtained from wheat.

One of the distinguishing characteristics of Chinese agriculture is the very skillful choice and adjustment of crops that will give maximum results under local growing conditions, and the crop yields can be regarded usually as the greatest that any given piece of land is capable of producing under reasonably favorable conditions. The combination of abundant yields and multiple cropping favor a high maintenance capacity of the Chinese farms.

Basic factors in Chinese agriculture.—The yields per acre, the kinds of crops produced, and the agricultural practices are related closely to climate, soils, and topography. These are fundamental in Chinese agriculture, and are considered briefly in the following paragraphs. But a number of non-environmental factors are also of primary importance, and they are essential to an interpretation of the agricultural status of China. Thus the inadequacy of transportation facilities may be shown to play a significant rôle in explaining the present conditions in many parts of the country. Moreover, the adherence to ancient customs and traditions, the super-fertilization of their fields, the carefully worked out multiple cropping systems, all are essential to an understanding of Chinese agriculture.

Climate as related to agriculture.—Of all the factors of the natural environment, climate is of fundamental importance as regards diversity of crops and cropping systems in China. Thus in the extreme northern parts of the country the cold winters eliminate the possibility of two crops a year and confine agriculture chiefly to spring planted crops, which in these areas consist mainly of kaoliang, millet, beans, and maize. But farther south, on the great plain of north China, crops are sown during fall, spring, and summer. Here the characteristic fall-sown crops include winter wheat, barley, broad beans, rape seed; the spring-sown crops comprise kaoliang, millet, and in the southern districts some cotton; whereas beans, millet, corn. sweet potatoes, sesamum, and peanuts are generally planted

during the period of summer. Farther to the south in China, as in the Yangtze Kiang Basin, the humid subtropical climate enables the extensive cultivation of rice. Here agriculture is concentrated on the alluvial areas along the Yangtze and in the innumerable valleys that extend into the mountains and hills of this region. To the north of the Yangtze Kiang the rainfall is deficient in amount and rice culture is confined mainly to lowlands where water is available for irrigation. South of the river, the rainfall is more abundant and in some districts even two crops of rice are obtained. In general, as much cultivated land is given to rice as rainfall and irrigation facilities will permit.[13] But the rice lands par excellence are found in the southern and southeastern parts of China—areas that are favored by abundant rainfall and high temperatures. In some districts three crops are obtained per annum. These southern areas also produce crops similar to those grown in the great plain of north China and in the Yangtze Kiang Basin; in addition, the agricultural landscape reflects certain tropical plants.

The relief factor.—Like climate, relief is a fundamental and persistent factor, and not only sets broad limits to the potential crop land, but also makes necessary differences in agricultural practices from place to place. The general highland character of China, with its many mountains, plateaus, and hills, accounts primarily for the small percentage of cultivated land (17 to 18 per cent). To a marked degree the lowlands constitute the chief geographical base for agricultural pursuits. But relief also affects agriculture indirectly, as for example, through the climatic factor. Thus the Tsinling Range of mountains and hills, which stretch east and west across China just to the north of the Yangtze River, separates a land to the south of one and two crops of paddy rice from a land to the north of winter wheat, millet, kaoliang, beans, and corn. During winter the same range has likewise modified the influence of the monsoons upon the temperatures of the two regions, providing protection to the Yangtze Valley from the cold winds which

[13] Based very largely on reports by Mr. Paul O. Nyhus, American Agricultural Commissioner in Shanghai.

sweep down from the plateaus of central Asia. North China is exposed to these cold winds. In addition, China is divided by a number of north-south trending ranges which cause progressively less rainfall as the monsoons move west to northwest.[14]

Agricultural methods and practices.—The agricultural methods employed by the Chinese farmer must be considered thorough and scientific regardless of his lack of a scientific understanding of the traditional practices which he follows closely. For the most part his laborious methods are an adjustment to low wage rates and poor economic conditions, and are not unscientific as to principles of crop production. Emphasis should be placed on the low living standards, for which there appear primary causes, including: (1) overpopulation; (2) lack of collective organized effort outside of the family unit; (3) lack of good governmental leadership; and (4) lack of proper education.

Fertilization of crops.—The high maintenance capacity of Chinese farms is made possible in large part through the system of fertilization found in that country. Nothing goes to waste. A wasteful economic order would mean disaster in a land of teeming populations. Night soil is of major importance in maintaining fertility, and all farm yard refuse, rice chaff, and various forms of waste vegetable substances are carefully composted. In the innumerable canal districts the agriculturists remove the fertile mud that collects in the channels of the canals, spreading this substance over the adjacent lands. In some cases more than 70 tons of such material have been used on an acre of land. Even the ash of practically all of the fuel used in the homes finds its way ultimately to the fields. In addition, the Chinese have learned through centuries of experience that the use of green manures is essential to enduring fertility. Thus in some fields, especially in the Yangtze Kiang Basin and farther south, a variety of clover is sown in the fall and plowed under in May and June. In the canal districts a

[14] See *Foreign Crops and Markets*, Vol. 20, No. 16, p. 591. Taken from a detailed report by Paul O. Nyhus on "Weather, Agriculture, and Famine in Northwest China," Washington, D. C.

common practice consists of stacking clover, which is then saturated from time to time with river mud, thus making a cheap and quite effective fertilizer. In the flooded fields of growing rice, grasses and weeds are cut and later pushed into the mud with the worker's feet. Commercial fertilizers, such as the well-known mixtures of mineral-fertilizer, are but little used.

Multiple cropping.—Another major factor accounting for the high maintenance capacity of the Chinese farms is the system of multiple cropping. Since the crops are commonly planted in hills and rows with intertillage, one will often find different crops in alternate rows, the various crops having been planted at different times of the year. Thus one crop may be near maturity, while another is just planted, and still another is but half grown. Multiple cropping is associated with painstaking tillage, and it involves proper fertilization and care of the land at all times.

Population figures.—No exact population figure can be given for China, since the country lacks a precise official census enumeration. But many estimates have been made, among which the Post Office estimate for 1926 is noteworthy. It places the Chinese population at 461,700,000, and is based on the Post Office reports of the various hsien of China.[15] This figure does not include Farther Tibet, Outer Mongolia, and Manchukuo, and probably is somewhat too large.[16] Another more recent estimate (1931) by the Ministry of the Interior places the total population at 474,000,000; whereas the Directorate of Statistics of the Nanking Government in 1932 states that there are 78,568,000 households in China, which would seem to indicate that the population is at least 470,000,000 if we allow six people per household. Other estimates have been made by various scholars and missionary workers,[17] and their recent estimates in general indicate more than 450,000,000. It

[15] A hsien is a minor political subdivision comparable to a county in the United States.

[16] Directorate General of Posts, Minister of Communications: *Lists of Post Offices,* the Twelfth Issue, Post Office, Shanghai, 1926.

[17] Lieu, D. K.: "A Brief Account of Statistical Work in China," *Bulletin de L'Institut International de Statistique,* Vol. XXV (1931), Tokyo, pp. 88-120.

is probably safe to say that the Chinese population at the present time is more than 460,000,000.

Population densities.—If a population density is computed for all of China, the resultant figure—about 120 per square mile—does not appear to be very high. But that figure is essentially meaningless, for it takes into account the extensive, sparsely populated areas of Mongolia, Sinkiang, and Tibet. On the other hand, the major river basins and associated highlands in the agricultural eastern two-thirds of provincial China show extremely high densities. Thus the great plain of north China probably contains approximately 650 people per square mile, whereas the delta regions of the Si and Yangtze rivers have densities of at least 1,500 people per square mile of land, and in the Chengtu Plain of Szechwan the density increases to more than 2,000 per square mile. But only from 17 to 18 per cent of China may be considered crop land, upon which the greater part of the population is directly dependent. According to the Directorate of Statistics of the Nanking Government in 1932, there are approximately 208,000,000 acres (325,000 square miles) of cultivated land in China, which means a population density of 1,446 per square mile if the total population is estimated at 470,000,000.

Pressure of population.—With more than two people per acre of cultivated land, China is confronted with critical problems pertaining to the relationship of population to land and resources. Most investigators find that the population is increasing from year to year in spite of natural checks, such as floods, droughts, and the losses due to civil warfare and banditry. Per capita wealth has decreased while the population has increased. On the basis of the present standard of life of her inhabitants, China is not overpopulated and could probably provide sustenance for additional millions. But a Chinese people with any appreciably higher standard of life would find land and resources insufficient to satisfy their greater wants and desires. This large human agglomeration will long remain agricultural, and there remains but little additional land that is suitable for crop production. Better transportation facilities

are greatly needed in China, and these will open up some of the present-day inaccessible areas and make possible further developments along various lines. Moreover, it has been suggested that the Chinese might further intensify their agriculture and thus enable the growth of population or possibly the maintenance of a population that has a high standard of life. But it must be emphasized that the Chinese are already producing an abundance of foodstuffs per unit area, as indicated by an average production of more than 2,400 pounds of rice per acre. Greater industrialization has been a safety valve in the population growth in other lands and has been suggested for China. The extent to which industrial development has taken place and the possibilities for further development will be considered in Chapter XXV.

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CHAPTER XXIV

China—Regions

The Si Kiang Basin.—This basin region is a land of hills and rivers. It comprises the greater part of the provinces of Kwangtung and Kwangsi, extends into the tableland of southern Kweichow, and presents a strikingly hilly and rugged landscape, with densely populated, intensively cultivated river valleys extending as narrow ribbons of land in the midst of hills (Fig. 161). From the standpoint of human occupancy, the important physical feature of the whole region is the Si (West) River and its tributaries. These give integrity to the region. They bind this relatively self-contained geographical unit together, since the waterways are commonly followed in making local trade contacts, and their valleys are the most important agricultural areas. Canton and Hong Kong are the chief commercial gateways of the region.

The major part of the Si Basin lies south of the Tropic of Cancer and the climate of the region is essentially tropical in type (tropical wet and dry). Rainfall is abundant and is associated with the monsoon of summer and the occasional typhoons that visit this region.[1] The period of abundant precipitation extends from April to September, whereas the winter months are dry (Fig. 162). The coastal districts have more than 70 inches of rainfall, but there is a decrease to less than 50 inches in the western part of the region. Temperatures are high during all periods of the year, as is indicated by the January average of approximately 70°F. in the seaward districts of the region. The summer temperatures are not as high as the latitude would seem to suggest, but the high humidity in association with continuously high temperatures during the sum-

[1] This region is not visited by the typhoons as frequently as is the southeastern coastal region of Fukien and Chekiang.

mer half-year combine to make enervating conditions for the occupants of the region.

The agricultural industry.—Favored with a climate that enables year-round agricultural activity, and supplied with many canals and streams, the Si Kiang Basin is one of the most intensively cultivated regions in China. Crop production flourishes in the river plains and has spread into the hills in the

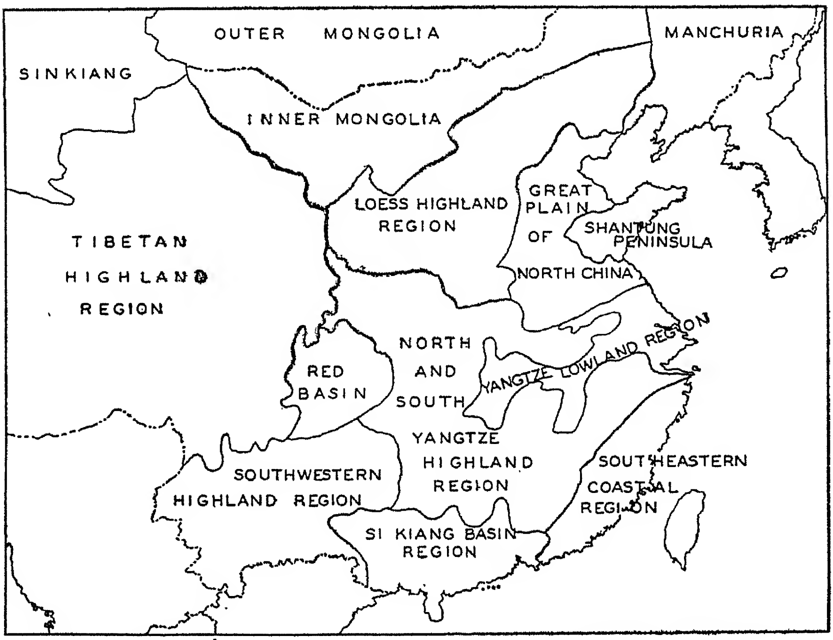

Fig. 161.—Geographical regions of China.

form of terrace agriculture, which has partly overcome the handicap of the predominantly rugged land surface. Yet many of the steep slopes remain bare and uncultivated; and the rugged topography, rather than any other single factor of the environment, accounts for the relatively sparse population in large parts of this region, especially in the province of Kwangsi.

Agriculture is mainly of the subsistence type, and rice is the most important crop (Fig. 163). Other crops include pulses, maize, barley, tea, tobacco, spices, and fruits. The tropical

climate of the region is reflected in the important place given to sugar cane in some districts, and in the widespread practice of growing two and sometimes three crops of rice a year. When rice follows rice in the cropping system, the first crop is set out in March and harvested in July; the second is transplanted in July and harvested in October and November. The cereal pro-

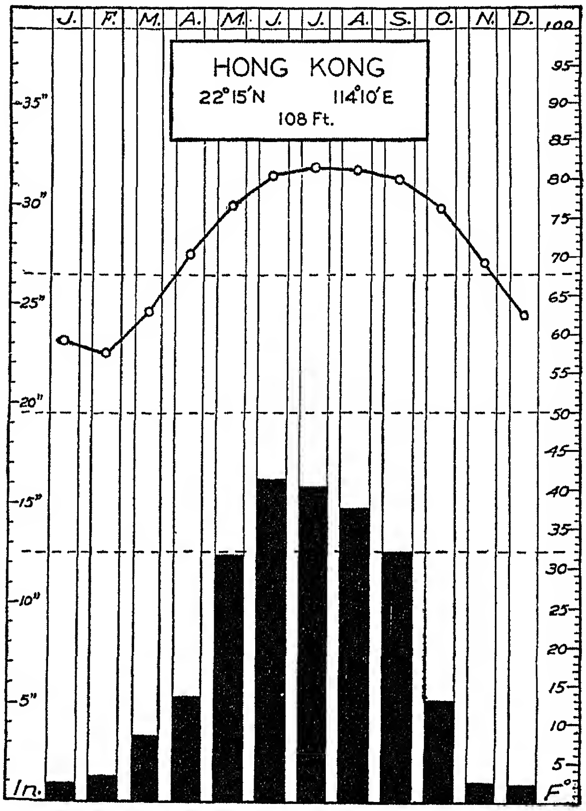

Fig. 162.—Average monthly temperature and rainfall records at Hong Kong, China.

duction of the region, however, varies from time to time in accordance with the variation in climatic conditions. Fruits and vegetables are always important, the orange being one of the chief fruits of the area. Even the banana is grown in some of the seaward districts, which gives the region a further claim to an agriculture that is essentially tropical in character. Ginger,

palm leaves for fans, and matting straw are obtained from some areas.

Sericulture.—The Si Kiang Basin is one of the distinctive sericultural regions of China. Statistical reports indicate that Kwangtung Province alone produces approximately one-sev-

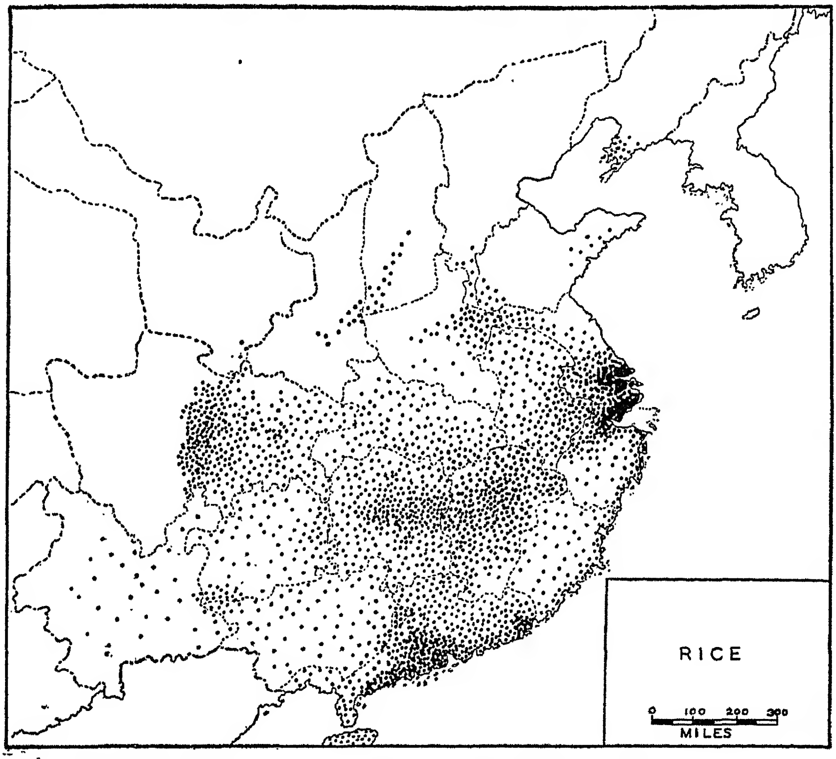

Fig. 163.—Distribution of rice in China. Each dot represents 20,000 acres.

enth of the world's raw silk. Here the raw silk production centers mainly in the delta country in the lower part of the Si and Pearl Rivers, where more than 1,000 square miles of land are devoted to mulberry trees. The latter are quite shrubby in structure, and the farmers keep the trees pruned down to a height of some five or six feet. The shrubs are cut close to the ground each autumn, and from the suckers which first come up during the early part of spring a number of crops of leaves are realized. In fact, the leaves are picked at intervals of about a

month as the shoots grow in size and produce new leaves and twigs after each picking, until some six or seven crops have been obtained. Here we find a fundamental contrast with the sericulture of regions farther north in China, which is due mainly to the favorable climate enabling a longer season of mulberry production and a greater number of cocoon crops in the Si Kiang Basin. The six to seven pickings of mulberry leaves makes possible six or seven crops of worms, the season of silkworm production beginning in late February or early March. A little more than a month (34 days) is required for each of the six or seven crops of worms, depending upon local climatic conditions and the growth of the mulberry shrubs, whose leaves constitute the only food of the silkworm. Thus the season of raw silk production extends from the beginning of March to October, whereas in the lower part of the Yangtze Basin of central China the greater part of the cocooon crop is marketed in May and June.

In marketing their crop the agriculturists sell the cocoons to filatures, where reeling of the filaments from the cocoons is the chief occupation of the workers, the final product being the raw silk of commerce.[2] The silk business of this region is markedly concentrated on the Si Kiang Delta south of Canton in the district of Shuntak, which in 1930 had 135 filatures. By reason of this high degree of concentration of the silk industry, Shuntak is a financial center par excellence, and Shuntak capital is said to finance the greater number of the banks of Canton.

Other major economic developments.—Although the hills and valleys of the Si Kiang Basin are known to be well supplied with various kinds of minerals, production is relatively small. Some coal is mined north of Canton, whereas iron ore is lacking. There is also a small production of tin, tungsten, manganese, antimony, and bismuth. However, further geological studies are essential before the mineral wealth of the region will be known with scientific accuracy.

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[2] It takes approximately 800 pounds of dry cocoons or 2,400 pounds of fresh cocoons to yield a picul of 133 1/3 pounds of raw silk.

The region has had a long commercial history; in fact, this is the part of China that first established important trade contacts with distant lands—first with Arab and Portuguese, then with the British. The development of British trade led to the acquisition of the island of Hong Kong as a base for their commercial activities.

Canton, the industrial and commercial rival of Hong Kong, contains approximately one and a half million people, and has made rapid strides in modernization in recent years. Progress was long handicapped by superstitious beliefs and the adherence to ancient customs. This long prevented the Cantonese from erecting tall buildings. But the present-day urban landscape of the city reflects not only the breaking down of superstitious beliefs, but also the results of well-established trade contacts as well as ideas and money brought back from distant lands by emigrant Chinese. Now Canton contains wide, well-paved streets, motor busses, large buildings, and other features of a modern municipality.

Another of the important trade centers of this region is Kowloon, which will be considered briefly along with Canton and Hong Kong in the following chapter.

The people.—The people of this part of China are shorter of stature and less sturdy and robust than those of north China. It is from this southern region, especially the Canton Delta, that great numbers of Chinese have emigrated and have established themselves as business people and traders in other countries, especially in various parts of southeastern Asia. In fact, a greater number of Chinese have emigrated from the Si Kiang Basin than from all the rest of China.

One of the interesting population groups of the lower Si Kiang Valley is the so-called "floating population of Canton," which is estimated at 100,000 persons. It is believed that these river-faring people, who are born, live, and die in their curious river crafts, took to the water three centuries ago, when the Manchu Tartar hordes conquered China; the Chinese at Canton refused to give allegiance to the Manchu rulers and sought independence by living afloat.

The outlook.—Two major occupations permeate the economic life of the region—agriculture and commerce. These show striking contrasts. This agriculture still clings to ancient practices, and the agricultural landscape reflects Old China, whereas the commercial life is concentrated in large cities in which the culture pattern attests the incorporation of ideas that are considered modern in our commercial world. The modernization of the urban life is due in large part to emigration from this part of China and the contact of the emigrant Chinese with their homeland. These major occupations—agriculture and commerce—will also pervade the future economic life of the area, with industry and mining occupying minor positions. Sericulture has become a well-established enterprise in the delta part of the region and will occupy a noteworthy place in the future.

Lack of adequate transportation facilities is one of the handicaps to economic development, but in this respect various parts of the region differ strikingly. Thus the delta region is reached by cheap ocean and canal transportation, whereas the hills farther west are an impediment to the construction of modern means of commerce.

Southwestern highlands.—The southwestern highlands flank the Si Kiang Basin region on the west and embrace the mountain ranges of Yunnan and the vast tableland that stretches into the province of Kweichow, where it reaches its widest extent. In the eastern tableland part of the region the drainage is eastward into the Si and Yangtze rivers; in the western and southwestern parts it is southward into the river basins of peninsular Indo-China. In this part of China there is considerable physical diversity. Diversity of relief is matched by diversity in climate as well as of flora and fauna. On the long steep highland slopes of Yunnan the climate varies from the humid tropical type of the valley bottoms to cool, temperate types of the summit areas. Since the average elevation of the entire region is considerable, the average seasonal and annual temperatures are lower than the latitude would seem to suggest.

Land utilization.—The southwestern highland region contains a much smaller percentage of arable land than is found in China as a whole. Although more than eight per cent of the total area of Kweichow Province is arable land, the entire region has probably less than seven per cent of its total area under the plow, since Yunnan, the western province of the region, has an extremely rugged topography. The remaining land consists of waste areas, native pastures, and forests.

A study of the land utilization, with special reference to the agricultural population, shows approximately 3.3 acres of cultivated land per farm household, or a little less than the average for China as a whole. Moreover, approximately 42 per cent of all the cultivated land located in the southwestern highland region is irrigated.

The cultivated land is devoted mainly to rice, wheat, corn, soy beans, barley, kaoliang, and millets. In addition, sugar cane, cotton, tea, and tobacco, although not leaders in point of acreage, are important from the standpoint of value, and play a prominent rôle in the agricultural economy of many districts. Rice forms the staple cereal and is the principal crop. In fact, it covers approximately 50 per cent of the cultivated land. Beans constitute the principal crop in some districts, and wheat is an important crop in central Yunnan, whereas kaoliang and millets enter the cropping system in many areas. Sugar cane is grown in abundance in all the tropical and subtropical valleys of the region, and is usually marketed in the form of coarse brown sugar or a crystalized rock candy. Cotton is grown chiefly for the local markets, where it is woven into the native blue cotton cloth, which is in constant demand. Other crops include hemp, fruits, sesame, and buckwheat.

Livestock industry.—On a per capita basis, the livestock industry of the southwestern highland region is unimportant as compared with that industry in countries of the Occident. Yet it is important locally because of the rugged topography and abundant pastures, and it could be further developed in many districts. In total numbers, hogs, sheep, and cattle are

the leading types of livestock. Water buffaloes are important in the Yunnanese part of the region, and originally came into the area by way of the river valleys which provide gentle gradients to peninsular Indo-China. Water buffaloes and cattle are the chief work animals in most districts. Their hides constitute a noteworthy item in the internal trade. Goat skins have long been exported from this region, but have met increasing competition at Tientsin, Hankow, and Shanghai. Some hogs are kept in essentially all districts, and the various statistical estimates that have been computed show that hogs are more numerous than any other single type of livestock. Some pig bristles and hams are shipped out of the region.

Forest and mineral resources.—Although a number of important species of trees are found in the southwestern highlands, the timber production is only of minor importance. The climatic zonation is matched by various zones of native vegetation and a great number of species of trees. Noteworthy are the pine, fir, cypress, chestnut, walnut, mulberry, tung (wood oil), and camphor trees.

The known mineral wealth of the region is largely unexploited, and the most distinctive minerals are the metals; chiefly, tin, antimony, zinc, silver, lead, mercury, and copper. Of these, tin is the most important, mainly because of the concentrated production in the Kotchin district of Yunnan, where most of the mines are owned and operated by people who have but little capital and who carry on mining operations by rather primitive methods. Kweichow Province produces mercury; and Yunnan, antimony. During the World War the antimony production of Yunnan was important, amounting to more than 100,000 tons annually, whereas the present (1932) output is essentially nil. Coal is found in many districts, chiefly bituminous and lignite, and the principal operations are found along the Haiphong-Yunnanfu Railway of Yunnan.

Transportation and trade.—One of the major handicaps to economic development in the southwestern highland region is poor transportation. With tropical jungles, steep-sided can-

yons, high barrier ridges, and inhospitable population groups in some districts, the region possesses the most meager transportation facilities of any part of eastern agricultural China. Trails and dirt roads constitute the chief routes of trade. Of the trails serving Kweichow, two are noteworthy. One road extends northward from Kweiyang, the capitol of the province, to Chungking on the Yangtze River; another crosses the province, extending eastward to Hunan and westward to Yunnanfu. Roads and trails radiate outward from Yunnanfu, the capitol of Yunnan. One of these extends westward to Bhamo in Burma; another has been built eastward to Kwangtung Province; whereas still others have been projected northward to the Yangtze Valley (Suifu on the Yangtze Kiang) and southward to French Indo-China. But travel by road generally involves expensive coolie transport, dangers of brigands, and even considerable delays on most of the roads. Thus travel by road from Yunnanfu to the Yangtze Kiang usually requires more than a month of time.

The only railway service of the region is that of the French-owned railway which connects Yunnanfu and the tin mining district of Kotchin with Haiphong, French Indo-China. This road also constitutes the only means of ready contact with the Pacific. It crosses innumerable chasms and highland ridges, and winds along narrow ledges. It called for a considerable amount of capital and required much engineering skill before it was completed.

The internal or domestic trade of the region is more important than the foreign trade. Food, clothing, cotton yarns, raw cotton, hides, hard fibers, and salt are major items of the domestic trade. In the foreign trade Yunnan is the leading commercial producer of tin in China, and accounts for China's rank among tin-producing countries. Of the imports, kerosene is a major item, a large part of which (50 per cent) is obtained from the United States.

Southeastern coastal region.—Located in south China, the southeastern coastal region is a major geographical unit, possessing various distinguishing characteristics that set it off

from the Yangtze lowland region on the north and the Si Kiang Basin region on the south. It comprises no single basin, but rather a number of individual river basins, in most parts of which the steep gradients and narrow gorges make river transportation impossible. The western boundary of the region is defined by the headwater areas of the major rivers. West of this boundary lies the south Yangtze highland region. The region as a whole is very rugged, and the entire seaward margin is broken, consisting of numerous minor indentations and promontories. Life tends to gravitate toward the river basins, especially the mouths of the larger rivers, which are favored with level alluvial soil and connections with the hinterland as well as distant lands. The largest of these individual basins is that of the Min Kiang and its tributaries. Among the various other rivers of the region, the Wu Kiang, the Lung Kiang, and the Han Kiang are noteworthy. Near or at the mouth of each of these a port has developed: Foochow near the mouth of the Min Kiang; Wenchow at the mouth of the Wu Kiang; Amoy at the mouth of the Lung Kiang; and Swatow near the mouth of the Han Kiang.

The climate of the region is characterized by high temperatures, abundant precipitation, and frequent visitations of the typhoon during the summer and fall months. Lying athwart the paths followed by great numbers of typhoons, the southeastern coastal region has a more abundant precipitation than any other part of China. Although the typhoons frequently cause great losses to the shipping interests and to the fisheries located along this coast, they are responsible for copious rains. In fact, sometimes three to four inches of rain may be associated with the movement of a single typhoon in the course of 24 hours. These storms usually lose their force very quickly as they move inland.

The human response.—With a population of more than 400 per square mile of land, the southeastern coastal region is one of the most densely populated parts of China. The rugged highland character of the landscape suggests a further concentration of population in the more favored areas. Economic

life is governed very largely by three sets of factors: (1) the rugged relief of the region; (2) the humid subtropical climate, with its abundant rainfall and high temperatures; and (3) the broken coastal region, with its fisheries, commerce, and intensive agriculture. The rugged, mountainous character of the land surface has set narrow limits to the cultivated area, and less than 10 per cent of the whole region is level, the level land being confined mainly to the lower parts of river valleys. The warm climate associated with abundant precipitation has favored a semi-tropical agriculture, and two crops even of rice are obtained on the same land in many districts. Only at rare intervals does the temperature drop to freezing, the average January temperature of the region being about 50°F. The broken coastal fringe is one of the distinctive parts of the region. Here the numerous indentations provide natural harbors for seafaring activities. Many of these, however, have poor contacts with the interior, and others are too shallow to admit large ocean-going vessels. In the delta districts of the larger rivers, the most important commercial cities of the region have developed. Here also is found the most extensive areas of level agricultural land.

From a cropping standpoint, the southeastern coastal region is primarily a rice growing area (Fig. 163). In the eastern part of Fukien and Chekiang provinces two crops of rice are commonly grown each year. But in the inland, western districts only one crop of rice is grown on the same land, because of the sharp reduction of rainfall in July. However, two crops—an "early" and a "late" crop—are reported in many of the latter districts. The first crop of rice depends upon the early rains of March to June. It is normally harvested in July or August, and is followed by wheat, sweet potatoes, and soy beans. On the other hand, the so-called "late" crop, under this system of cropping, is planted in June on land that can be irrigated, and harvest takes place in October. In these western districts of the region the easily flooded land is seldom planted to anything but rice, and there is only one harvest a year on the same land.

For the region as a whole, the other crops of importance include wheat, rape seed, soy beans, sugar cane, vegetables, tobacco, and fruits. The long growing season enables many harvests of vegetables within a year, particularly in the coastal districts, which are also favored with large city markets.

Other economic activities.—Along the coastal margins, the fisheries have developed. Here have been the training schools of seamanship, and from these districts great numbers of Chinese have migrated to distant lands, especially to other parts of southern Asia, where they are engaged chiefly in business and trade.

In addition to the resources of the sea, the region possesses extensive forested areas in which fir, pine, camphor, and rosewood are important trees. The bamboo should also be emphasized. It is one of the most widely distributed and most useful of the native plants of the region. In many districts, especially the areas in which the topography is unfavorable for crop production, forests should occupy the land permanently.

Commercial life is concentrated in the coastal cities. Of these, the most important are Foochow, Amoy, Wenchow, and Swatow. Here recent modernization is causing changes in the urban landscape.

The south and north Yangtze highlands.—Rugged topography characterizes interior agricultural China north and south of the Yangtze Kiang lowlands. Thus we may recognize the north and south Yangtze highland regions, but these differ strikingly in their physical make up. The Yangtze lowlands are flanked on the north by extensive east-west trending highlands, comprising mainly a mountain belt, which constitutes a striking geographic boundary between north and south China. It intercepts the southeast monsoon winds during summer, acts as a protecting barrier against the cold outflowing air currents of winter, and therefore, climatically, separates humid subtropical and tropical south China from middle-latitude continental north China; it separates well-watered

south China from a land of low and irregular precipitation. On the other hand, compared with the highlands located to the north of the Yangtze, the south Yangtze highlands have a lower average elevation, more rounded slopes, and greater amounts of rainfall. Here the climate should be considered temperate, mainly by reason of the interior position and altitude of the region.

The north Yangtze highland region contains the Tsingling Shan, the greatest mountains of agricultural China; the Tapa Shan, located between the Han Kiang Valley and the lowlands of Szechwan; and the much lower Hwaiyang Shan, which comprises the eastern part of the region.

Economic development.—The north and south Yangtze highland regions show marked contrasts in human responses. With a population of 35 to 40 millions of people, the mountain belt located north of the river has a smaller total population and a lower population density than has the south Yangtze highland. In the latter region the amount of gently rolling land is quite extensive, and the percentage of cultivated land is approximately the same as for China as a whole (17 to 18 per cent). The valley cultivation is intensive in character as reflected by the fact that a square mile of crop land supports more than 2,000 people. While agriculture is thus concentrated chiefly in the valley bottoms of the highlands both north and south of the Yangtze Valley, there is a greater amount of level land among the hills and highlands south of the river. Throughout both regions one may find extensive areas of steep slopes where the removal of trees has resulted in destructive erosion. Some districts still have stands of timber, but the high cost of transportation constitutes a marked obstacle to exploitation.

In the agriculture of both regions, rice is the major crop in point of acreage as well as of yields. Tea is the most distinctive crop, especially in the south Yangtze highland region, which possesses more than 60 per cent of the tea land of China.

Of the mineral resources, coal is the leading item. In addi-

tion, these highlands contain ores of antimony, tungsten, lead, and zinc; all of which are exploited at the present time, but production is generally small.

The outlook.—Agriculture is the dominant activity, and present trends indicate that this occupation will long remain the most important source of wealth in the north and south Yangtze highlands. The agricultural landscape reflects a striking concentration of life in the lowland districts of these regions, whereas many of the steep slopes are barren and suffer from erosion because of the removal of the native vegetative cover. Reforestation has therefore been suggested as a remedial measure. Of the other natural resources, the minerals are exploited in some areas; but the exact mineral wealth of these highlands is not known, and production will increase only as industry and transportation are further developed. Poor transportation facilities constitute a major handicap and are in large part due to the rugged character of the land surface of these areas.

The Yangtze lowland region.—With an areal extent of approximately 75,000 square miles of land and a population density of more than 650 people per square mile, the Yangtze lowland region is the leading industrial, commercial, and political unit of China. It contains a great number of large cities, among which one finds Hankow, Nanking, Soochow, and Shanghai—the latter being the commercial giant of all of China. It is the ranking industrial region of the country, constitutes the center of China's cotton textile industry, and contains more than 200 silk filatures. Here the progress of industrial development is making life more diversified, and the standard of life is taking new forms in many districts, mainly in the urban areas.

The physical setting.—Favorable location is one of the major advantages of the region. It is served by the Yangtze, the largest river in Asia and the only river in China that is navigable for a long distance inland. The rest of China's rivers are unnavigable for ocean-going vessels, except in their lower courses. The Yangtze Kiang opens the vast interior of China

to the sea. It is navigable to Hankow (630 miles) for 10,000-ton vessels during the summer season, and has connected to it thousands of miles of navigable tributary streams and canals. In addition, there is a great development of coastwise trading which centers at the mouth of the Yangtze. This river serves the most populous region of China, the great Yangtze Basin, with its 750,000 square miles of land and a population that numbers approximately 200,000,000.

The Yangtze lowland region is the most highly developed part of the entire basin. It comprises the plains that are located to the seaward of Ichang. These plains have been built up by the river mud brought down from the adjacent highlands. Some districts are covered with lakes, the largest of which are Tungting, Poyang, Hungtze, and Tai. These are decreasing in size (on long time bases), and show wide fluctuations in level from season to season, being almost dry during winter.

The climate of the region is humid subtropical, the growing season being about 300 days in length. The moderately abundant precipitation (about 45 inches) is associated with the period of the summer monsoon, whereas the fall and winter months are relatively dry. The average range of temperature from winter to summer is greater than that in the Si Kiang Basin and the southeastern coastal region, but it is less than the range in north China, where the winter temperatures go down to relatively low points. Summers are long and humid; winters are rather mild, with only short periods in which the temperatures fall below freezing. At Hankow the average temperature during January, the coldest month, is 40°F., whereas July has an average of approximately 85°F. (Fig. 164). Temperature variations from day to day and from week to week are influenced greatly by the cyclonic storms, which are pronounced in the Yangtze lowlands.

Agricultural development.—In this region of level plains, rivers, and canals, the agricultural landscape reflects a strikingly intensive utilization of the land. There is some diversity in land utilization and agricultural practices from place to

place, yet the cropping systems of the entire region have certain basic similarities. Thus winter cropping, in general, and the summer crops consist of as much rice as irrigation, water facilities, and suitable land will permit. Other summer crops

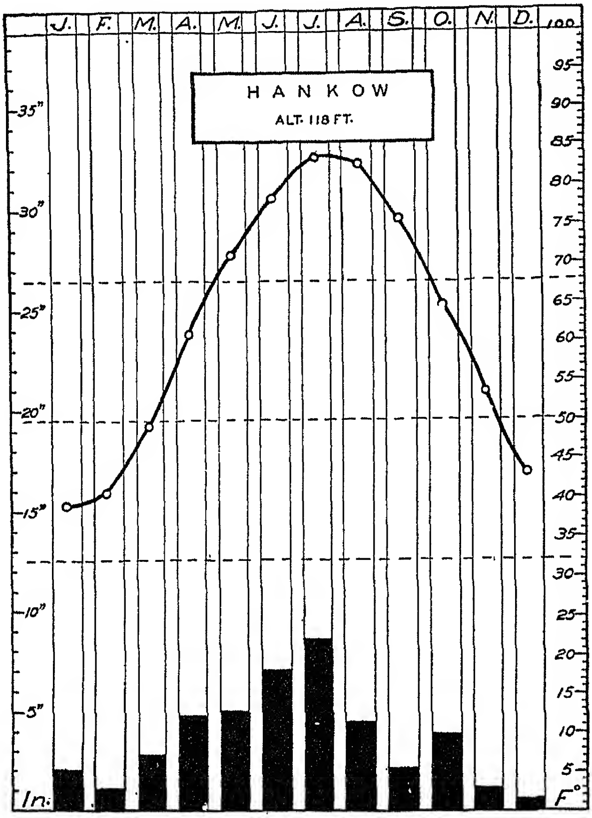

Fig. 164.—Mean monthly rainfall and temperatures at Hankow.

are cotton, corn, and beans. The winter crops (fall sown crops), on the other hand, include wheat, barley, broad beans, and rape seed, of which winter wheat is most important.

Of all the crops, rice ranks first in acreage and in yields for the region as a whole (Fig. 163). Here it is generally a summer crop, being followed by a system of dry land winter cropping after the October harvest. Rice culture is associated with painstaking methods of fertilization and irrigation of the land.

Night soil is of foremost importance, whereas in canal districts the fertile sediment in the canals is removed and spread over the fields. In addition, composts are made from farm yard refuse, rice chaff, and all other forms of waste materials. In the irrigated districts water is obtained by various methods.

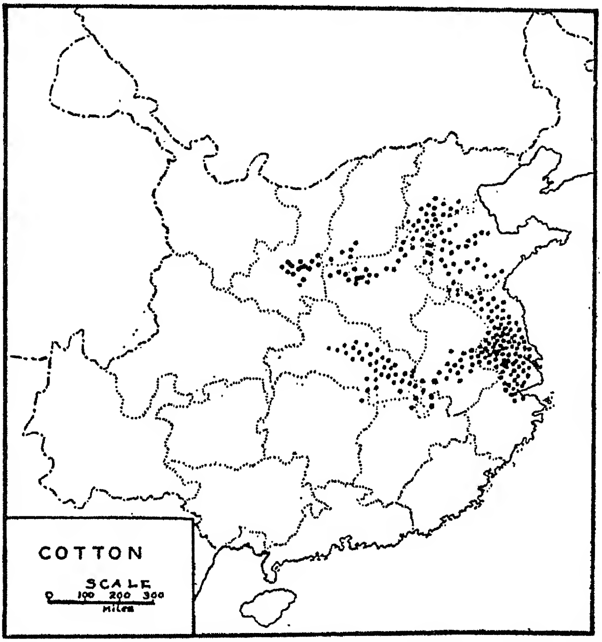

Fig. 165.—Geographical distribution of cotton in China. Each dot represents 20,000 acres.

In some places human tread arrangements and scooping buckets are employed, but a more general use is an endless chain of wooden paddles running in a wooden trough, the lower end of which is in the canal, the other end being elevated onto the paddy field. A horizontal wheel is geared to the endless chain. To this wheel is attached a sweep, which is turned by the power of cattle or water buffalo. A recent practice consists of using pumps operated with oil engines. These are installed on canal boats and lift the water from the canals onto the rice fields.

Of the various regions in China, the Yangtze lowland is

distinctive in the production of cotton (Fig. 165). Like rice, cotton is a summer crop, and in some districts from 15 to 30 per cent of the crop land is devoted to this commodity. Yet for the region as a whole, cotton occupies probably no more than five per cent of the cropped area. The cotton is of the poorer short staple variety, which has proven to be most successful because of the environmental conditions that prevail and the cropping systems that are necessary in this densely populated land. The introduction of long staple species of cotton has not met with success. Such species require a longer growing season, which in this part of China interferes with the planting of winter crops, the latter being necessary because of the great demand for foodstuffs. Moreover, the short-staple Chinese bolls turn downward and are therefore less liable to destruction by fungus diseases than various of the long staple, upright species of foreign cotton.

Other important agricultural commodities of the region include wheat, barley, beans, corn, mulberry, water chestnuts, peanuts, and sweet potatoes.

Industrial and commercial development.—In China the lower Yangtze region occupies a leading position in industry and commerce. The large local market, the favorable climate for the growth of cotton, and the advantageous location combine to make this area distinctive in the cotton textile industry, which has reached its most marked development in the Shanghai district. In addition, the region contains many silk filatures (200), various blast furnaces (at Hanyang), tobacco factories, flour mills, and a few cement plants.

The region contains Shanghai, the leading commercial center of China, and Hankow, which ranks among the 10 chief ports of the country. Shanghai normally handles more than 40 per cent of China's trade. Located on the inland bank of the Whangpoo, at a port 15 miles from the southern channel of the estuary of the Yangtze Kiang, Shanghai has adequate protection (from storms, winds, etc.) and the harbor is sufficiently deep for sea-going vessels. The city is built on low, swampy ground underlain with unconsolidated alluvium.

The Red Basin of Szechwan.—The Red Basin is one of the most distinctive geographical units of China. Surrounded by highlands and separated from the Yangtze lowlands by the gorges of the Yangtze, the Red Basin is handicapped by lack of easy contact with other regions; but here has developed one of the most densely populated areas of China. By reason of its fertility, the Red Basin is known as the "garden of the Province of Szechwan."

Although it is low in comparison to the surrounding country, the surface of the Red Basin is by no means flat, but should be considered quite rugged in character. Steep-sided, rounded hills cover the basin, with the exception of a few level areas, the most important of which is the Chengtu Plain. The summit level of the hills lies between the 3,000- and 4,000-foot contours. The soil is of red sand and clay of the Jurassic series, which has been derived from the underlying soft red and yellowish red sandstones which lie beneath the basin. These in turn are underlaid by coal-bearing formations and limestone, which have been bent into folds and exposed by erosion in some districts. Within the basin, various rivers and their associated valleys are important natural features; such as, the Min, the Chung, the Suining, and the Kialing. Of these, the Min River is most noteworthy, since its sediment has formed the gently sloping alluvial fan which constitutes the geographical base of the Chengtu Plain.

The climate of the basin is affected by the encircling mountain ranges, which shut out the cold winds during the winter season. The climate, in fact, is fairly uniform throughout, the temperature varying from about 35°F. in winter to 90° in summer. Temperatures seldom drop below the freezing point during the cold season, and they seldom rise above 100°F. during summer. During January the average temperature at Chengtu is 44°F. The rainfall shows a striking concentration during the summer season, the southern districts receiving the greater amounts of precipitation. The rainfall is less than that of the Yangtze lowland regions, yet the basin is well supplied with moisture (35 to 45 inches a year), and it is not

subject to the extreme droughts and famines that are experienced in various other parts of China.[3]

Irrigation.—In the Red Basin the slope of the land makes irrigation by gravity easy. In some districts, however, the natural flow of the water is so great that it has to be considerably lessened before the water can be led off to the fields. Thus the Min River is occasionally torrential at Kwanhsien even in the dry season, while at the height of the summer monsoon the river threatens to sweep away everything in its path. Here the two Lis (Li Ping and Li "the Second") began the stupendous project (about 200 B. C.) which resulted in the intricate system of canals and laterals in the Chengtu Plain, the first work consisting of the deepening and adjustment of a gorge above Kwanhsien. Below Kwanhsien the waters were spread laterally by division into innumerable channels. The whole project consisted of the construction of strong dikes and embankments. The two Lis have become objects of pious veneration and worship, and the opening of the main dike usually follows an important ceremonial service. Here a temple (the temple of Li) has been erected in honor of Li "the Second," which displays the motto of this engineer: "Shen t'ao t'an; ti tso yen"—"dig deep the bars; keep low the dikes."

In the rolling, hilly parts of the Red Basin, water is often lifted to the terraced hillsides by means of water-wheels.

The agricultural industry.—Intensive agriculture characterizes the Red Basin, especially the level Chengtu Plain, where a growing crop may be seen at all seasons of the year. Rice is the major crop in most sections. In the Chengtu Plain, rice occupies the land from April to August, and is usually followed by wheat, barley, or rape. Rice, corn, sugar cane, tobacco, potatoes, and vegetables are commonly grown on the land during the summer half-year, whereas wheat, barley, rape, and beans occupy much of the crop land in winter. Local areas surrounding towns and cities are often known for some

[3] Brown, H. D., and Li Min Liang: "A Survey of 50 Farms on the Chengtu Plain," *Chinese Economic Journal*, Vol. II (1928), p. 45.

distinctive crop. Thus some area may be noted for its mulberry, another for hemp, and still another for its tobacco; whereas all suburban districts are important producers of vegetables. In the drier hill-country, where water for irrigation is not available, millet and sorghum are the important cereals.

Life of the people.—In the open agricultural districts, farmsteads are generally scattered irrigularly at intervals of a few hundred yards, and they are approached by narrow paths which wind around the small, irregular fields. The arrangement of the farm buildings is in a square, surrounding a small courtyard. Along the periphery of the courtyard one will find the living quarters, animal and poultry barn, implement house, and storage buildings. Surrounding the buildings is a high wall, designed to protect the house from thieves. The farm buildings are of the customary type in China, the walls consisting of mud or plaster, the roofs of tile.

Mineral exploitation.—The Red Basin has abundant reserves of coal. According to the estimate given by Wong and Ting, Szechwan Province has almost 10,000,000,000 metric tons of coal, most of which is bituminous. But coal mining is seriously handicapped by poor transportation and by the preventive methods employed in the exploitation of this mineral. Moreover, in most areas the coal measures are too deeply buried to be of any value at the present time.

Of the various mineral resources exploited at the present time, salt is distinctive. There is a large and constant demand for salt. The domestic product is manufactured from brine, which is obtained chiefly from three resources: sea water, salt lakes, and salt wells. Lacking salt lakes and sea water, the Red Basin obtains its supply from salt wells. Salt manufactured from brine obtained from wells is an old and important industry in the Basin, the chief center of the industry being Tzeliutsing. Here the brine is obtained by means of wells bored to considerable depths. The boring of the wells takes many years of patient labor with bamboo poles and some primitive iron tools. The brine is transported to the evaporating works by coolies and pack animals. The region

has natural gas, which is used for the evaporation of the liquid.[4] Several hundred thousand people in the Red Basin depend directly upon the salt industry. Some of them work at the wells, others transport the brine, while still others are employed in the districts where the liquid is evaporated.

Outlook.—The Red Basin is one of the most intensely cultivated regions of all China. It contains the Chengtu Plain, where the average population density exceeds 2,100 people per square mile of land. What is most urgently needed is a higher standard of life of the millions of people occupying the region rather than any further increase in the population. Poor transportation, in fact, is one of the major handicaps to further economic development in this part of China, and better means of transportation will enable the extension of economic production to resources that are untouched at the present time. Railroads are lacking. Surplus economic goods tend to gravitate toward Chungking, where they await shipment through the gorges of the Yangtze. Within the basin, however, the local commerce is taken care of mainly by the bayfoo, or coolie carriers. Yet this type of transportation is expensive in spite of the low wages that the coolies receive.

The Great Plain of North China.—As the largest compact area of agricultural land in China, the Great Plain embraces more than 125,000 square miles and contains a population of approximately 81,000,000. This well defined geographical region includes most of the province of Hopei, western Shantung, eastern Honan, and the northern part of Anhwei and Kiangsu. On the north, west, and southwest, the boundary of the Great Plain of north China is clearly marked by encircling highlands. On the east the highlands of the Shantung Peninsula prevent the plain from extending uninterrupted to the sea, whereas the southeastern boundary comprises the rice-producing plains of the Yangtze lowland region.

The Great Plain is remarkably level. It is so level in many districts that large tracts are covered by standing water after

[4] Chinese Government Bureau of Economic Information: "The Salt Wells of Szechwan," *The Chinese Economic Monthly*, Vol. III (1926), pp. 519-526.

heavy rains—a condition that causes crop failures and even famines. This level land surface is the product of ages of sedimentation in a region that was originally a part of the Yellow Sea. In fact, at one time the highlands of the Shantung Peninsula constituted an island; and the region now occupied by the Great Plain was a shallow embayment into which the Hwang Ho poured its heavy load of silt and river mud drawn from the mountains and plateaus of central Asia and the unconsolidated materials of the loess highlands located west of the Great Plain. The slowly rising sea bottom was an additional factor in making land out of this vast embayment.

On this level land surface the Hwang Ho released much of its load, raised its channel, and overflowed its banks repeatedly. The river has flowed alternately to the north and to the south of the Shantung Peninsula, and has reached the sea at points as much as 250 miles apart.[5] Its last major change was in 1851, when it shifted its course from the south to the north of the Shantung Peninsula. Many floods have since been experienced in this region. Some of these have been widespread and have resulted in loss of life and inestimable property damage, such as the floods of 1877 and 1898.[6] Where millions of people press close on the bands of subsistence, flood conditions cause acute famines; and the term "China's Sorrow" has been applied to the irregular, changeable Hwang Ho.[7]

The natural landscape of the great plain reflects a yellowish appearance, the color of the loess which caps the highlands to the west, and which is carried into the region not only by the Hwang Ho but also by the famous dust storms of north China. The predominating color is forcibly suggested in the term Hwang Ho (Yellow River) and the name of the sea into which this river flows (Yellow Sea).

The climate of this region is distinctive. Unlike that of the Yangtze lowland region, the climate is definitely temperate in

[5] Clapp, F. G.: "The Hwang Ho, Yellow River," *Geographical Review,* Vol. XII (1922), p. 18.

[6] *Ibid.*

[7] Mallory, Walter H.: *China—Land of Famine,* American Geographical Society, New York, 1926.

character. It is a humid continental type (humid continental with long summers) rather than humid subtropical. The climate of winter is characterized by extremely low temperatures at various intervals. In January the average temperature

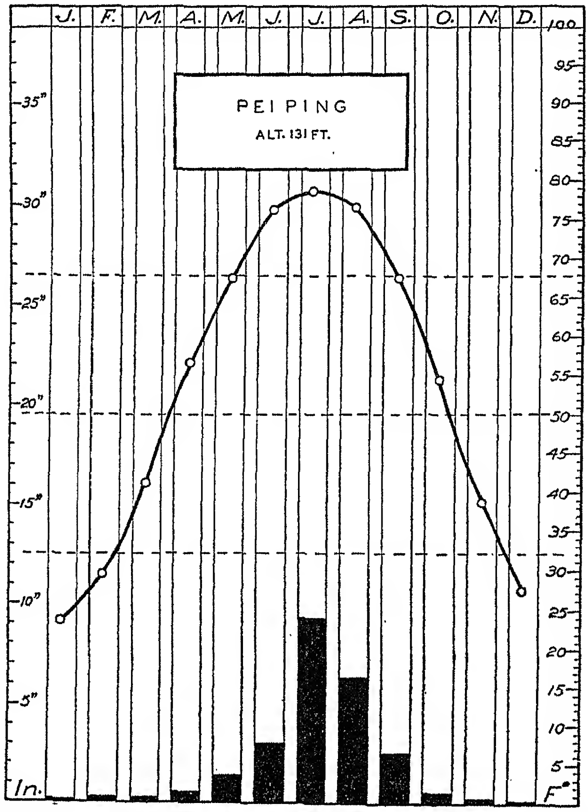

Fig. 166.—Mean monthly rainfall and temperatures at Peiping.

at Peiping is 23.5°F. (Fig. 166). During summer, on the other hand, the temperature soars to relatively high points, and in a normal year records of more than 100°F. are obtained. Precipitation shows a marked seasonal distribution, the winters being almost rainless. Rainfall is therefore associated with the summer monsoon. In the northern part of the region the periodicity of the rains is strongly marked, the summer season (June to August) receiving more than 70 per cent of the an-

nual amount. But in the southern districts the periodicity is less marked, and there is a greater spread of precipitation throughout the year.[8] The total annual amount of rainfall (20 to 27 inches) is less than that experienced in the Yangtze Basin, and it varies considerably from year to year. The er-

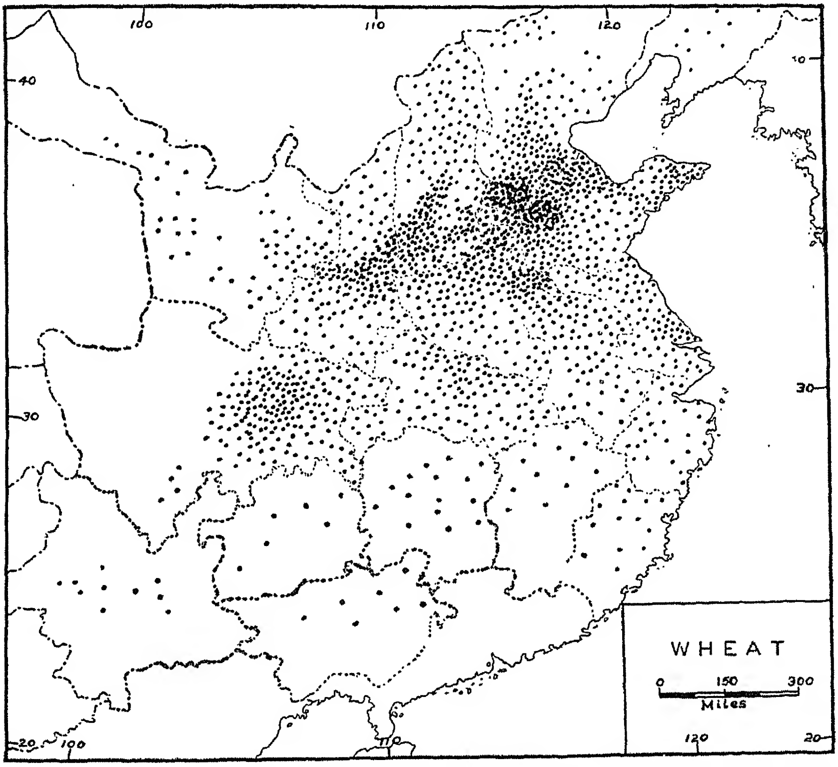

Fig. 167.—Geographical distribution of wheat in China. Each dot represents 20,000 acres.

ratic precipitation is another major handicap in this part of China, inasmuch as famines are caused by abnormally large as well as abnormally small amounts of rain.

Land utilization.—Approximately two-thirds of the total area of the Great Plain of North China is cultivated land. Unlike the Yangtze Basin and lands farther south, this region

[8] Here December is the only month in which the average rainfall is less than one inch.

produces wheat, kaoliang, millet, barley, and beans rather than rice. In October approximately one-half to three-fourths of the crop land is usually sown to winter wheat, the amount decreasing with distance from south to north (Fig. 167). After the harvest of winter wheat—late May or early June—the land is planted to summer crops, among which corn, beans, and millet are leaders in point of acreage. In the north, corn is usually interplanted with soy beans; whereas in the southern districts of the plain (south of the Yellow River), soy beans constitute the chief summer crop. Kaoliang is generally planted during April, and it is the major spring-sown crop, with millet next in importance. Thus millet is a summer crop, sown after the wheat harvest in early June, as well as a spring-planted crop. Other important crops grown in this region are sweet potatoes, tobacco, some cotton, peanuts, and sesame.

Since irrigation is not widely practical in this part of China, failure of the rains is a serious factor. During spring a failure of the none-too-adequate rains greatly reduces the wheat yields, whereas a precipitation of even the small amounts of two or three inches during May insures moderately good returns. In a few districts, hand-operated wells lift the water to the thirsty earth during the dry periods. But there are also periods of excessive rains. These are generally experienced at the height of the summer monsoon. Although periods of excessive rains are often associated with floods and call for flood control, the most acute famines on the great plain of north China have been caused by drought rather than by too much rain.[9]

The outlook.—With its 81,000,000 people and 125,000 square miles of land, the Great Plain of north China ranks among the leading agricultural regions of the world as a producer of foodstuffs. Here agriculture is the chief source of wealth, and approximately 90 per cent of the inhabitants depend directly upon this major occupation. It is not a land of

[9] Bureau of Agricultural Economics, Washington, D. C.: "Cropping Systems and Regional Agriculture in China," *Foreign Crops and Markets*, Vol. XXII (1931), p. 739.

large urban concentrations. The people, on the other hand, live chiefly in villages and in the country. Groups of buildings rather than single, isolated structures characterize the rural landscape. Here agriculture will remain the chief occupation of the inhabitants.

The agricultural peoples are but little concerned with commercial production, most of the output being consumed by the large local population. Years of drought and excessive rainfall cause serious crop losses and famines in this densely populated land. Even a slight seasonal reduction in crop yields proves fatal in many districts. A smaller population utilizing the land which is now developed would mean greater returns per capita, a possibility of storing more food for periods of dearth, and therefore less likelihood of widespread famines.

Industry and business are concentrated in the major cities, of which Peiping is the largest (1,460,000). The other cities with populations of more than 100,000 each are Tientsin, Tsinan, Kaifeng, Suchow, Weihsien, Paoting, and Tangshan. Of these, Tsinan is the chief seaport. Its future is assured by reason of its vast hinterland. Peiping, on the other hand, bases its importance on political and social factors rather than on its advantageous geographical location for commercial development.

The level surface of the plain has greatly favored the development of transportation facilities. In the further development of its roads and railroads the region possesses great potentialities.

The Shantung highlands.—The Shantung highlands constitute a well-defined geographical unit, which is set off sharply from the Great Plain of north China. Unlike the loess highlands of northwest China, the Shantung highlands have a hard-rock base, consisting of metamorphosed sedimentary series and granites. Intersecting the highlands are many mountain valleys which constitute the geographical base for the most significant agricultural activities. In spite of the rugged character of the topography and the impression of barrenness which characterizes much of the region, many districts of the

Shantung highlands are densely populated. In fact, the pressure of population (more than 1,400 per square mile of crop land) is so great that famines are common.[10]

The Shantung highlands are well located for trade contacts with other areas. The peninsular location and various harbors along the coast have favored coastwise trade and commercial contacts with other parts of the Far East.

The seaward location of the region is reflected in the climate, which in general is similar to the climate of the Great Plain of north China. But the temperature range is somewhat less than that of the latter region and the rainfall is greater, especially in winter. Winds that come from the north move across the Gulf of Chihli, impinge upon the northern highlands of Shantung, and expend their moisture in the form of snow.

Land utilization.—Although most of the region consists of barren uncultivated slopes, the percentage of crop land is relatively large (approximately 20 per cent) when the rugged character of the topography is taken into account. Like the major part of north China, the Shantung highlands produce winter wheat, k'aoliang, and millet. In the typical, inland districts, the agriculturist, will sow approximately half of his crop land to winter wheat. The greater part of the remaining cultivated land is given to kaoliang and millet during the following spring. When the winter wheat is harvested in the latter part of May or early June, beans are sown in its place. After harvest during the fall of the year (usually September) the millet and kaoliang areas are planted to winter wheat.

Natural resources.—The region contains various mineral resources. Coal, gold, and iron ore are exploited in varying amounts. Coal is obtained in several districts. Under German control the coal fields of Fangtzu and Weihsien were developed, although this coal is surpassed in quality in the areas of Chihchuan and Po-shan. High grade iron ore is found near Ichowfu. Here iron, limestone, and coal are found in juxtaposition. Gold is worked near Weihsien.

[10] Chinese Government Bureau of Economic Information: "Famines in Shantung," *Chinese Economic Journal,* Vol. II (1928), pp. 36-43.

The Shantung highlands are essentially bare of trees, and forestry is unknown. A tree cover is essential in a land of hills and mountains. During the heavy rains of summer, violent freshets are formed; and since erosion is pronounced, land is ruined in many districts. A scientific system of reforestation would greatly correct this evil. A beginning was made when the German Government planted some groves of trees among the hills near Tsingtao.[11]

The loess highlands.—The highlands on the western border of the Great Plain of north China constitute the beginning of the best developed and most extensive area of loess hills and mountains in the world. This loess highland region embraces all of Shansi, northern and central Shensi, northern Kansu, the extreme western part of Hopei and the major part of western Honan.

The distinctive natural feature of the region is the loess, a wind-blown silt that is intermediate in texture between clay and sand. During the winter monsoon, storms and winds from the desert and steppe regions of Mongolia carry vast quantities of dust into the loess highlands. During thousands of years this dust has covered mountains, filled valleys, and created new hills of yellow silt. The characteristic vertical cleavage of the loess deposits is suggestive of the natural terraces that have been formed in many districts.[12] Rivers have cut deep gorges through the loess, and old caravan trails in some districts have worn deep channels into this material. Throughout the region the natural landscape has a yellow appearance. Agriculturally, the loess is considered fertile, although it has a low humus content. It has been formed in a region of low precipitation, and therefore has not been leached of essential mineral plant foods. In addition, it has the capacity for absorbing and storing large amounts of water.

The climate of the loess highlands is intermediate in character between that of the Great Plain of north China and the

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[11] When Germany was in possession of the leased territory of Kiaochow.

[12] For a geological account of the loess see Barbour, G. B.: "The Loess Problem of China," *Geological Magazine,* Vol. LXVII (1930), pp. 458-475.

climate of Mongolia. The winter temperatures are lower than those experienced in the Great Plain. At Taiyuan, Shansi, the average temperature for the entire winter season (Dec., Jan., and Feb.) is only 22.7°F. The critical element of the climatic environment, however, is precipitation, which is less in amount and more erratic in distribution than that of the great plain. The north Yangtze highlands (Tsingling Shan and Hwaiyang Shan) located south of the region shut it off from the direct influence of the southeast monsoon. Within the region there is a decrease in precipitation from east to west. Precipitation during winter when the monsoon blows seaward is extremely scant, as indicated by the fact that most parts of the region receive less than two inches of rainfall during the period from October to March.

Land utilization.—Approximately 17 per cent of the loess highlands is cultivated land, whereas most of the remaining area consists of barren slopes. The crop land is devoted mainly to winter wheat, kaoliang, millet, and pulses. The cropping systems, however, differ strikingly within the region. Thus the low winter temperatures in northern Shansi and Shensi confine the cropping system to summer crops: millet, kaoliang, spring wheat, beans, potatoes, and oats. Here short-season crops are essential because of the early frosts. Low winter temperatures preclude the production of winter wheat, a crop that finds an important place in the cropping system in other parts of north China.

In southern Shansi and central Shensi, on the other hand, the winters are sufficiently favorable for winter wheat (Fig. 167). In this part of the loess highlands winter cropping occupies more than three-fourths of the farm land. The valley of the Wei Ho, or the so-called "cradle of Chinese civilization," is located within this area. On the Wei Plain approximately 90 per cent of the crop land is devoted to winter cropping, chiefly winter wheat.

Farther west in the loess highlands of Kansu, millet and barley are the leading crops. In many districts of this province

more than 50 per cent of the cultivated land is devoted to millet.[13]

Natural resources.—Although trees are seen on farms and along roads in the loess highlands, and forests probably were widespread at one time, the region is now strikingly barren and devoid of forests, except in some of the remote inaccessible highland districts. As the forest cover was removed and the highland slopes were exposed to cultivation, erosion ruined many areas. It is also the belief of some scientists that the removal of the vegetative cover caused more concentrated and erratic precipitation in the region.

The native vegetation has been over-exploited, but the minerals await exploitation, especially the coal deposits. Shansi, the eastern province of the region, has approximately one-half of China's total reserve. But these deposits are deeply buried under deposits of loess and await the development of better means of transportation before they are mined in large quantities. At the present time coal production is essentially confined to a few of the eastern districts of the region. Location near the Great Plain of north China is an important factor to consider from the standpoint of future development.

Earthquakes and famines.—The loess highlands have experienced some of the most severe earthquakes known to mankind. When the underlying rocks of the region are subject to stresses and strains, causing them to break or to slip along the break, the overlying loess is shaken violently and landslides develop on an enormous scale. Thus whole villages have been buried under the loess. One of these violent earthquakes swept Kansu Province in 1920,[14] and caused a loss of life estimated at more than 200,000 people.

The loess highland region has experienced widespread famines. As in other parts of China, its people are poor and

[13] Based very largely on reports of Nyhus, Paul O: *Cropping Systems and Regional Agriculture in China*. U. S. Bureau of Agricultural Economics, Washington, D. C., 1931.

[14] Close, U., and McCormick. E.: "Where the Mountains Walked," *National Geographic Magazine*, Vol. XLI (1922), pp. 445-464.

possess only scanty reserves of food for lean years. The pressure of population is great, as indicated by the density of more than 1,200 people per square mile of crop land. The region lacks a well distributed and sufficient rainfall, and the uncertain climate is the major uncontrollable factor which affects the material well-being of the inhabitants. In addition, various parts of the region are inaccessible and possess very poor transportation facilities. During recent years famines have been intensified because of military maneuvers and brigandage.

The plateaus of Mongolia.—Vast expanses of middle latitude desert and steppe are located to the north and northwest of the loess highlands. Here is the home of the Mongol, a term that appears to have been derived from mong (brave men). As a physical entity, Mongolia extends from the Altai-Sayan-Trans Baikal chains to the Khingan Mountains. It is a vast grassland, divided between desert and steppe. The more humid, semi-arid districts are located in the eastern and southeastern parts of the region. These have witnessed the immigration of great numbers of agricultural Chinese during recent years. Special colonization offices have been established by the Chinese Government in the cities of Kalgan and Suiyan for the purpose of obtaining land and regulating the friendly departure of the Mongols in Chahar, Suiyan, and Ningsia. The purchased land is then sold to farmers who come from overcrowded north China.[15]

It is the belief of various scientists that the area between the Onon and Kerulen Rivers southeast of Lake Baikal constituted the original homeland of the Mongols. From this nuclear area they extended their domain and reached the zenith of their power as members of the vast empire of Kublai Khan.

Major economic activities.—Pastoral nomadism is the major occupation of the Mongol. From scattered pasture and scant field he wrings a miserable subsistence. His animals consist chiefly of sheep, cattle, and ponies. From the flocks

[15] Wilm, Paul: "The Agricultural Methods of Chinese Colonists in Mongolia," *Chinese Economic Journal,* Vol. I (1927), pp. 1023-1025.

the nomad obtains the necessary milk, mutton, wool, and skins.

Crop production is confined to the eastern and southeastern parts of Mongolia, chiefly the areas that have witnessed Chinese immigration. Unlike the small agricultural holdings of provincial China (3.5 acres of crop land), the crop-producing parts of Mongolia possess relatively large farms, averaging approximately 30 acres each.

The agricultural life is intimately associated with geographical conditions. Although the soil in many districts is well supplied with mineral plant foods and humus, the continental semi-arid climate, with its great fluctuations in rainfall and extremes of temperature, frequently causes unsatisfactory yields. The sub-zero winter temperatures preclude the production of any kind of winter crop. Moreover, the winters and early spring months are dry, and frequently the farmers must postpone the sowing of crops until June because of the delayed rains. There are occasional years in which the growing season is too short for satisfactory ripening of crops, and often the rains are concentrated in a short period of only six weeks (end of June to the middle of August). Such environmental conditions are strikingly different from those of agricultural China. One harvest must cover the expenses of a whole year, and only quickly maturing northern plants can be grown. Thus instead of the rice, kaoliang, cotton, soy beans, sweet potatoes, winter wheat, and other characteristic crops of Old China, the crop lands of Mongolia are devoted to barley, oats, summer wheat, millet, buckwheat, rape, and peas.[16]

On the Chinese farms in Mongolia the livestock consists chiefly of hogs, chickens, draft-animals (mules or oxen), and cattle. There is an enormous production of milk products. These satisfy the domestic requirements but do not enter world trade.[17]

The exploitation of animal life is clearly reflected in Mon-

[16] *Ibid.*, p. 1026.

[17] Volkonsky, M. T.: "Milk Products of Mongolia," *The Chinese Economic Monthly*, Vol. III (1926), pp. 540-550.

golia's chief surplus commodities—furs, skins, wool, etc. The region has long been noted for its excellent furs, many of which finally reach the United States.[18]

Mode of life.—The pastoral nomads move from place to place in search of suitable pastures for their livestock. Their houses are of two types—the travelling or simple ridge-pole tent covered with dark felt, and the more substantial one, known as the yurt. Even the yurt can be dismantled in a short time (half hour). In most areas the Mongols have formed small groups and villages. The unit of organization is under the leadership of an elected elder. Mongol villages tend to gravitate toward the valleys where water is available and the peoples as well as livestock are protected from the winds of the open plateaus. In the villages, corrals are provided to protect the weaker animals from wolves and other wild beasts. Flocks of sheep usually graze near the villages, whereas horses, ponies, and other beasts of burden are kept farther away. Fierce, shaggy dogs have a part in this setting, since they frighten stray marauders and wild beasts.

The people.—Although the term Mongol is often applied to all the peoples of the Far East, the Mongolian nomad is distinctive physically, and the various tribes of the country are connected linguistically. The Mongol has a semi-tanned rather than a yellow skin. As compared with the typical Chinaman, the Mongol has a less flattened nose, a larger face, less prominent cheek bones, and more oval eyes.

Islam and Buddhism are prevalent religious beliefs in Mongolia, except in the districts in which immigrant Chinese have settled. The Mongolian Buddhists are similar to those of Tibet, but among the pastoral nomads the objection to the destruction of life cannot exist. The slaughter of animals, an activity that is entirely out of harmony with Buddhist ideals, forms an important part of Mongol life.

Sinkiang.—Sinkiang, or Chinese Turkestan, consists in major part of the Tarim Basin (Kashgaria) located between

[18] Robinson, H. D.: "Mongolia, Its Trade Routes and Trends," *Commerce Reports* (Jan. 6, 1930), Washington, D. C., p. 18.

the Tien Shan and Kunlan Mountains (Fig. 168). In addition, it contains Dzungaria, the land which extends northward from the Tien Shan to the ranges of the Altai. Chinese Turkestan contains from five to six million people, more than four million of whom live in the Tarim Basin, the greater number being Mohammedans.

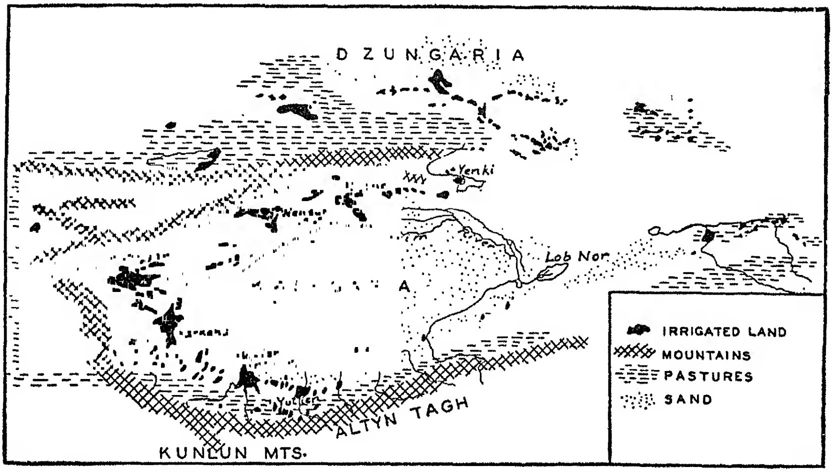

Fig. 168.—Irrigated land, mountains, and pastures of Sinkiang.

The climate is arid. To the south, the Altyn Tagh and the Kunlun Mountains constitute an effective barrier, being bounded still farther south by the high extensive Tibetan Plateau. To the north, the Tien Shan and Altai Mountains wring moisture from passing winds, whereas winds blowing from the east and northeast have crossed the extensive Mongolian Plateau and expended their moisture long before they reach Eastern Turkestan.

The peripheral highlands of the Tarim Basin wring moisture from passing winds, and therefore contain a number of streams which flow into the basin and afford opportunities for irrigation agriculture. Many of these streams, fed by the snows of the mountains, unite within the basin to form the Tarim River, which rises in the glaciers of the Karakorum Range, flows for a distance of 1,250 miles, and empties into the reedy swamps of Lop Nor, a shallow, extremely salt lake without an

outlet. Although the Tarim is a large river in summer, it contains but little water during winter.

Irrigation agriculture.—A study of land utilization in the Tarim Basin discloses the fact that irrigation agriculture is best developed along the borders of the region, at the foot of the highlands which surround it on three sides. Cultivated land is confined to small oases in the piedmont areas, the remainder of the land being pasture and waste. Crop production depends wholly on irrigation, and the crop land constitutes less than one half of one per cent of the total area of Sinkiang. In other words, while Sinkiang has a population density of only five per square mile, it has approximately 965 people to the square mile of cultivated land.[10] The cultivated land could be extended considerably by the introduction of better and more scientific methods of irrigation. However, this would necessitate a considerable outlay of capital, which the present political leaders are unlikely to supply.

In the piedmont districts of the Tien Shan Mountains there are many oases, both large and small, which lie along an ancient caravan route, the Tien-Shan-Nan-Shan Road to Kansu, China. In some places these oases, distributed like beads upon a thread, have given rise to the development of commercial towns which have long been important trading centers in central Asia. Important oases along the southern piedmont of the Tien Shan Mountains include Shufu (Kashgar), Wensuh (Aqsu), Kuche (Kocha), and Yenki (Quara Shahr) (Fig. 168).

Streams serving the oases carry large supplies of silt, drawn from the adjacent highlands, and deposit this material in the piedmont areas of the basin. In such districts fertile alluvial soils have been formed. But in some areas wind-blown sands are found, and the crop lands must be protected from the winds and sand by trees and small plants.

In the southern part of the basin along the Kunlun and Altyn Tagh Mountains is another major belt of oases, which

[10] Bradshaw, E.: "Sino-Russian Relations in Sinkiang," *Journal of Geography*, Vol. XXXI (1932), p. 61.

is separated from the Tien Shan oases by the Takla-makan Desert. Most of these irrigated alluvial districts are located at a distance from the point of final disappearance of their respective streams, out upon the finer, silty soil located beyond the piedmont gravels (Fig. 168). Noteworthy among the southern oases of the Tarim Basin are Soche (Yarkand), Yehcheng (Qarghalig), Hotien (Khotan), and Yutien (Keriya).

In the nothern part of Sinkiang (Dzungaria), most of the land is very poor and oasis agriculture is found only in a few of the valley districts, such as the northern piedmont areas of the Tien Shan and in the valley of the Ili River.

The chief crops grown under this irrigation agriculture in Sinkiang are wheat, rice, cotton, barley, vegetables, and fruits. In the midst of gardens and fields are located the flat-topped native houses.

Pastoral activities.—Since the mountains wring moisture from passing winds, native grasses are widespread. Thus many of the mountain slopes provide considerable areas of good pasture land. Pastures are also widely distributed in the piedmont areas. Thus we find the reason for the other major occupation of Sinkiang—pastoral nomadism. Settled cultivators, however, are much more numerous than the pastoral nomads. The livestock consist chiefly of horses, sheep, camels, and goats.

The outlook.—With regard to future developments in Sinkiang, two major problems must be emphasized: (1) the future political relations with China; and (2) the possibilities of future economic developments capable of taking care of further increases in population. The political outlook is not very certain at the present time; in fact, an element of insecurity pervades the political scene of this remote Chinese province. By reason of geographical proximity to the Soviet Union, Sinkiang's commercial relations are more intimately associated with her northern neighbor than with China, Russia being better represented by commercial officials. In fact, some investigators point to the possible development of a Soviet Republic in this part of central Asia.

The second major problem; i.e., possible increase in population, is closely associated with the future of irrigation agriculture in this region. On irrigation depends the life of the people. Some investigators estimate the ultimate population capacity at 20,000,000 people. Such development would have to rest very largely on increases of irrigated areas and improvements in methods of irrigation agriculture. The areal extent of crop lands is narrowly limited to those areas where water is available for purposes of irrigation. Such districts are already being utilized. But the methods of irrigation agriculture (Turki methods) are singularly bad, and there is considerable room for improvement.[20]

Tibet.—Tibet constitutes the world's largest high plateau, the major part of which is above the 14,000-foot contour. Individual mountain peaks rise to elevations of more than 20,000 feet, while even the valleys of the Tibetan borderlands are above the 10,000-foot level. Associated with the great altitude of the region are extremes of temperature and a surprisingly low average annual temperature for the latitude. In addition, the greater part of Tibet is an arid region. Only the borderlands receive a moderately large amount of precipitation, and there is a decrease in amount with distance north and northwest. The combination of rugged topography, great altitudes, extremes of temperature, low precipitation, and inaccessibility is reflected in the low population density for the region as a whole.

Only a small part of this vast highland region is under direct Chinese political influence; that is, the part adjacent to agricultural China, comprising mainly the eastern parts of the provinces known as Sikang and Chinghai (Koko Nor). Here the chief habitable districts comprise the valleys. The remaining greater part of Tibet is inaccessible, poorly served by transportation facilities, and is therefore essentially unaffected by external political forces.

Economic life.—The greater part of the Tibetan Plateau

[20] Schomberg, C. F.: "The Habitability of Chinese Turkestan," *Geographical Journal,* Vol. LXXX (1932), pp. 505-511.

should be classified as waste land, with most of the remainder devoted to grazing. Scattered nomadic tribes depend upon their herds of goats, yaks, sheep, and donkeys. Sedentary life is confined mainly to the peripheral valleys of the region, chiefly the valleys of streams that flow southward to India and Indo-China and eastward into China. Here the major crops include the hardier cereals, vegetables, and fruits. Among the cereals, barley is noteworthy, a crop that thrives at high altitudes and in high latitudes.

The people.—The unfavorable environment of Tibet places narrow limits on the growth of population. In some countries the safety valve to overpopulation is emigration, whereas in Tibet preventive checks have been evolved in the form of social devices, such as religious celibacy and polyandry. A social order in which each family sends a son to the Lamaseries to become a Lama priest accounts for the abnormally large development of the celibate class in Tibet, reaching a proportion of one-fourth of the total population in some districts. In Tibet the practice of polyandry is essentially restricted to the agricultural peoples, and constitutes an important factor in limiting population.[21]

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CHAPTER XXV

China—Mineral Resources, Industry, and Commerce

Coal.—Of all the minerals, coal is the most important to modern civilization, and the Industrial Revolution came only when coal was set to work. With regard to the coal factor, China is a relatively unimportant producer as well as consumer, and large reserves within the country remain untouched. Various estimates have been made of these reserves, the earliest of which was stated by Richtofen, but it was subsequently found that his figure was much too large. Estimates were later made as geological surveys revealed new coal fields and more detailed work made possible corrections on the older figures. The estimates given by Drake (1912), Hsieh (1925), and Wong and Hou (1932) have been stated by various writers. According to Drake, the possible Chinese coal reserve is 996,000,000,000 metric tons, the probable reserve being approximately 381,000,000,000 tons. Hsieh gave China a probable reserve of 217,000,000,000 metric tons, whereas Wong and Hou of the Chinese Geological Survey have arrived at a slightly larger figure (246,000,000,000 metric tons). Various of the recent surveys have disclosed the fact that approximately three-fourths of the total Chinese reserve consists of bituminous coal, most of the remainder being anthracite. In short, it is correct to say that China possesses one of the world's large coal reserves—an important factor affecting the possibility of future industrial development.

Although coal fields are found in all parts of China, the largest reserves are found in the provinces of Shansi and Shensi of the loess highlands region. Here Shansi Province alone contains more than half of all of China's coal. But the coal of

this northern region is buried under thick covers of loess. The southwestern highland region also contains valuable reserves of coal.

In spite of her large reserves, China is an unimportant producer of coal, the average annual production being only 25,000,000 metric tons. Japan uses ten times as much coal per capita, and the United States one hundred times as much as is consumed per capita in China. Lack of local capital, small demand, and poor transportation facilities are among the factors that set narrow limits on the production and consumption of this important mineral.

Petroleum and water power.—Although China possesses large reserves of coal, she has almost no petroleum, and her water power is undeveloped. Large sums of money have been invested in various parts of the country in the search for petroleum, but no significant field has been discovered as yet. Moreover, it is very unlikely that any large, profitable oil field will be found in the future. This fact is recognized by the Chinese Geological Survey.

In some countries water power is the silver lining of the power situation. In China, however, the water power is practically undeveloped. Large areas of the country, such as the deserts and steppes, have but little potential water power. In other regions, such as north China, the erratic precipitation causes violent fluctuations in stream flow, and the small amount of precipitation during winter is a further disadvantage. The best prospects for future development of hydroelectric power are found in the Yangtze Basin, south China, and in the humid eastern margins of Tibet.

Iron ore.—Among Asiatic countries, China holds a conspicuous rank in total reserve of iron ore. Authentic sources place the Chinese reserve at 212,000,000 metric tons.[1] But most of this ore has a metallic content of less than 35 per cent. Much of this low grade iron ore is high in silicate content (40 to 50

[1] The iron ore reserve of China is normally stated at 950,000,000 metric tons, as compiled by Tegengren for the National Geological Survey of China. But Manchukuo with its 738,000,000 tons is then included. I have given the figure only for China, since Manchukuo is treated separately in this text.

per cent). Pig iron made directly from such low grade, high silicate-content ore is generally unsatisfactory. Fortunately, China contains some scattered deposits of iron ore with a metallic content of more than 60 per cent, such as the ores at Tayeh in the province of Hupei.

An evaluation of the Chinese iron ore factor must lead to the conclusion that China is poorly supplied with that mineral, and mainly because of the small percentage of metallic content in the ore.

Tin, antimony, and tungsten.—Although her production is comparatively small, China is normally one of the seven leading producers of tin. As regards total value of various metals, tin is a rival of iron in China. Commercially, it is more important than iron.

The greater part of China's tin is obtained in the southwestern highland region. Here the Kotchiu district near Mengtze, Yunnan, is the chief source of supply. The tin of this district occurs as lodes in limestone rocks, the veins being deeply oxidized. Native mining prevails in this district. The lode ore is carried long distances up the steep slopes of the mine shafts on the backs of men. In recent years, however, modern equipment has been introduced. The greater part of this Yunnan tin is sent to Hong Kong, where it is refined.

Antimony is China's unique mineral wealth, the production being approximately 75 per cent of the world's output. This metal is found in various parts of China, with the principal deposits in the provinces of Hunan, Yunnan, Kweichow, Kwangtung, Szechwan, and Kwangsi. The greater part of the output comes from the Sikwanshan mines of Hunan Province.[2]

With her large, high-grade reserves of antimony and low labor costs, China has been able to produce this metal more cheaply than other nations. During the last few years, however, production costs have increased because of the development of labor unions and higher wage scales. This factor together with increases in freight rates, express rates, export

[2]Most of the antimony produced outside of Hunan is obtained in the province of Yunnan.

rates, and with general expenses has added considerably to the costs of production.

Similar to other mining enterprises in China, antimony exploitation is in the hands of many small producers. These mine the metal in a very crude, primitive way.

There is no definite information available with regard to the extent of China's tungsten-ore deposits. China, however, is a major producer of this metal, with half to three-fourths of the total output of the world. The most important tungsten mines are located in the provinces of Kiangsi, Kwangtung, and Hunan.

Other minerals.—Copper has been mined in China for a period of at least a thousand years. It is found in several provinces in southwestern and west-central China. The mines, however, are small, the ore is of low grade, and China appears to lack large reserves of this important metal.

As a producer of various other minerals, China occupies a minor role. Small quantities of lead, gold, mica, and zinc are obtained from widely scattered deposits worked mainly by the natives.

Future of the mineral industries.—Unlike the countries of western Europe and the United States, where industrial growth has been associated with the presence of abundant and varied mineral resources, China is handicapped in her deficiency of various minerals that are considered basic in the industrial life of nations. Although the country possesses abundant reserves of coal and limestone, large deposits of good iron ore are lacking. China is deficient in petroleum, copper, and sulphur, whereas the production of tin, antimony, and tungsten could be increased considerably.

The mineral industry of China is handicapped in various ways. The Chinese lack the necessary transportation facilities for large scale production. The country needs more railways and thousands of additional miles of good roads and highways. It needs peace and order, as well as capital, for the development of a modern mineral industry.

Present status of manufacturing in China.—Although richly endowed with an abundance of land and a large population, China is among the most backward countries with respect to the development of modern manufactures. Many factors account for this retarded industrial growth, among which are: (1) China's long isolation from important centers of civilization; (2) the tendency of the Chinese in their religion and tradition to emphasize agriculture at the expense of manufactures and commerce; (3) the importance of the family rather than the individual as the working industrial unit; (4) the meager development of transportation; (5) the frequent political disturbances; (6) a paucity of local capital; and (7) the practice of exacting likin and similar inland transit taxes.[3]

China, like other Asiatic countries, has not yet reached the industrial stage of economic development, and agriculture is still the dominant activity of the great masses of people. But owing to the large population of this country, there are perhaps more people engaged in some type of manufacture than are similarly employed in the United States. Among the great agricultural masses there are many people whose homes constitute workshops in which farmer and family work during the off season or when agricultural activities are impossible on the land.[4]

Workshop and cottage industries.—Manufacturing industries in China are not all of the modern factory type; indeed, far more numerous and important from the standpoint of Chinese economic life are the workshops and cottage industries. The Chinese workshops are in many respects similar to those of Medieval Europe, with their master workmen, apprentices, and journeymen. In some cases the workshop may have grown to such size that it is much like a modern factory, yet for one reason or another it cannot be so classified. In some cases there may be more than 100 workmen in one establishment, yet the shop is owned and operated by the

[3] See Lieu, D. K.: "China's Industrial Development," *Chinese Economic Journal*, Vol. I (July, 1927), pp. 672-673.

[4] James, H. P.: "Industrial China," *Economic Geography*, Vol V (1919), p. 1.

master-workman, with no capitalistic proprietor or manager who has not served apprenticeship in the trade itself.

Workshop and cottage industries provide large quantities of goods in common daily use throughout China. Among these are iron and copper cooking untensils, simple agricultural implements, baskets, ropes, felt mats for beds, braided mats made of reeds, rugs, harnesses, carts, boats, jewelry, porcelain ware, cotton cloth, and hosiery.

The cottage industry differs from the workshop industry in being distributed in a large number of households that have been supplied with the necessary machinery for producing a certain commodity. Some types of manufactures lend themselves readily to such production, typical of which are the making of hosiery and weaving of cloth. Thus in various cities hosiery factories have been established. At first female hands worked in the factory, but as demand for the products grew very rapidly and the factory had no adequate space to take in more laborers, arrangements were made for the distribution of machines to the laborers in their homes. The raw material, yarn, is also supplied. The wages are from 22 to 26 cents per dozen pairs of knitted stockings, but the laborers must pay a monthly rental for the use of the knitting machine.[5] On the part of the laborers such arrangement is agreeable, since they can attend to their household duties while earning a living. The weaving of cloth is also widely distributed as a cottage industry in this country.

Modern factories.—Within the last three decades a considerable number of modern industrial plants have been developed in China. Iron smelting plants with a combined annual capacity of approximately a million tons have been built in various parts of China, especially in the Yangtze Valley. Cotton spinning and weaving mills have assumed large proportions, silk filature establishments are developing rapidly, and flour mills are increasing in number.

[5] Lieu, D. K.: "China's Industrial Development," *Chinese Economic Journal,* Vol. I (1927), p. 659.

The cotton textile industry.—The cotton textile industry is China's largest modern manufacturing enterprise. The development of this industry in China began with the establishment of a Government owned and operated cotton mill in Shanghai. The country had 12 cotton mills in 1896, and 31 by 1915. During the World War the industry developed with remarkable rapidity.[6] The post-war period witnessed some fluctuation in the cotton textile business and trade, but the recent trends have been upward, so that by 1930 China had 127 cotton mills.

Localization of the cotton textile industry.—The concentration of this large Chinese industry in the lower Yangtze Valley is noteworthy. Of the 127 cotton mills located in China (1930), 61 are in Shanghai. Thirty of these Shanghai cotton mills belong to the Japanese, three are owned by the British, the remainder being Chinese. Shanghai, the leading port of China, is favorably located with regard to the raw material factor, the power factor, labor supply, and the large market of the Yangtze Kiang Basin.

Factors favoring the cotton textile industry.—China possesses a number of advantages for the development of the cotton textile industry. The domestic demand for cotton textile and yarns is enormous, the demand for yarns being greater than in any other country. The great masses of China's population wear clothing made of cotton. The country's large population furnishes an ample supply of cheap labor, and the manufacture of textiles is native to China. In addition, China ranks third among producers of raw cotton. This raw material is not of high quality, but the low price of the short staple Chinese cotton gives the local cotton mills a marked advantage in the production of heavy sheetings and drills. The domestic production of raw cotton, however, is not sufficient to meet present demands. Approximately one-third of the cotton used

[6] Huston, J. H.: "Changing Cotton Textile Trade of China." *Commerce Reports* (March, 1930), Washington, D. C., p. 580.

in this industry is obtained from foreign sources, chiefly from India.[7]

Factors that handicap China's textile industry.—Among the factors retarding the growth of China's cotton industry, the most important are: (1) political disturbances; (2) lack of necessary capital; (3) poor management; and (4) labor inefficiency. During periods of chaotic political conditions various factors handicap industrial progress. Taxation increases, the raw cotton production decreases, and capital becomes concentrated in a few places.[8] In general, the Chinese cotton mills are insufficiently supplied with capital. With this handicap the mills are unable to purchase their raw materials and sell their finished products advantageously. The management of many of the mills is conspicuously poor, especially the mills that were established by inexperienced people during the World War. Finally, the inefficiency of Chinese labor should be emphasized. Although this labor is abundant, it is not cheap. The low wages paid the workers are in large part responsible for the lack of efficiency and low per capita output. This point is forcibly illustrated by a comparison of the output per worker in the Chinese owned mills with that of the Japanese owned mills, in which the workers receive higher wages. Thus the better paid labor in the Japanese mills turns out approximately three times as much cloth and 21 per cent more yarn per worker as compared with the output per capita in the Chinese mills.

The silk industry.—Although Japan surpasses China as the world's leading source of silk, sericulture is one of China's oldest industries. This industry is widespread in agricultural China. Major producing areas include Kwangtung Province in the south, Kiangsu, Chekiang, Anhwei, Hupei, Hunan, and Szechwan in the central area, and Shantung and Honan in the

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[7] Bureau of Foreign and Domestic Commerce: "China's Production and Trade in Cotton Yarns," *Commerce Reports* (June 13, 1932), Washington, D. C.

[8] Fong, H. D.: "Cotton Industry and Trade in China," *The Chinese Social and Political Review*, Vol. XVI (1932), p. 419.

north. In Kwangtung the sericultural industry is confined mainly to the delta areas of the Si and Pearl Rivers. Here the chief raw-silk producing districts are Shuntak, Chungshui, Namhoi, and Samshui. The Shuntak district contains 135 steam filatures and 200 foot-power filatures, which provide work for approximately 70,000 people. In Chekiang Province the major sericultural districts are Hangchow and Huchow. Hangchow is well known for its silk goods, such as satins, crepe, brocades, and soft silks. These districts (Huchow and Hangchow) also weave mixtures of silk with rayon or cotton. In Kiangsu Province one of the largest silk-producing centers is Wusih, an industrial city located 80 miles from Shanghai and 113 miles from Nanking. Shanghai, however, constitutes the major market for central and northern districts. The importance of Shanghai as a center of sericulture is reflected in the large number (141 in 1930) of silk filatures which the city contains.

In north China the provinces of Shantung and Honan are noted for their output of pongee, which is woven from tussah silk. The silkworms from which the tussah silk is obtained feed on oak leaves rather than the mulberry. The oak leaves cause the silk to be impregnated with tannin. A brownish color, therefore, characterizes the raw material; and the tussah silk is not only coarser and stiffer than ordinary silk, but it is also more difficult to dye or bleach. In Shantung Province, Chefoo and Tsingtao are the chief distributing centers for pongee; in Honan the center of Hsuchow is most important.

The iron and steel industry.—Iron and steel are known to have been manufactured in China by primitive methods as early as 700 A. D. Modern blast furnaces, however, were first introduced in Hanyang less than a half century ago. Since then, such furnaces have been built in various parts of the country, and in 1928 there were 17 of these furnaces with a daily capacity varying from 12 to 450 tons of pig iron each. Although the total annual capacity of these is approximately a million tons of pig iron, within recent years the actual production has been less than 30 per cent of this amount.

With an iron ore reserve estimated at approximately 212,000,000 tons (mainly low grade), a coal reserve containing about 246,000,000,000 tons, and widespread deposits of limestone, China possesses the basic raw materials essential to the development of an iron and steel industry. Yet the country normally produces less than 600,000 tons of iron a year. With the consumption of iron amounting to approximately 600,000 tons a year, China's per capita average is strikingly low. In fact, the average per capita consumption of iron in the United States is approximately 183 times as large as that of China.

Although China possess large reserves of basic raw materials essential to the iron and steel industry, these are not readily available in most regions. But most of China's iron ore has a low metallic content, while many of the high-grade ores are so scattered that economical development cannot be realized. Thus the total reserve, especially as measured in terms of metallic content, is too small to satisfy prolonged, heavy demands of a large-scale modern blast furnace industry. The total Chinese reserve would be consumed by the iron industry of the United States in less than 10 years. In addition, the cost of coke laid down at the blast furnace stack houses is abnormally high. China contains a very large reserve of coking coal, but in many cases this commodity must be transported long distances to the iron-smelting centers. No appreciable development can be expected in the iron and steel industry of China until the blast furnaces of that country can obtain coke at costs approaching those of the United States, western Europe, and other producing units.[9]

The blast furnace industry of China is located mainly in the Yangtze Lowland Region.[10] The center of the industry of the Yangtze Basin is at Hanyang. But the pig iron production of this district has shown a sharp decline during recent years. Hanyang depends upon highgrade iron ore obtained from

[9] Hoyt, L. W.: "Blast Furnaces and Steel Mills in China," Bureau of Foreign and Domestic Commerce, *Report No. 4373*, Washington, D. C., August 15, 1922.

[10] The iron and steel industry of Manchuria will be considered in Chapter XXVI.

Tayeh. One of the major handicaps to the development of the industry in this district is the high cost of coke.

General character of transportation in China.—Probably no other economic means helps or retards the development of a country more than its system of transportation, in which respect China is conspicuously behind many other countries. Its railroad mileage is even less than that of small European countries, such as Italy and Spain, and equal to only one twenty-fifth of the mileage of the United States. Its highways are in poor condition, and the majority of people in China have indeed never seen an improved highway. This lack of good transportation has held parts of China helpless for centuries. In fact, whole districts are cut off from contact with the outer world and are reduced to self-support and self-supply. If such people have a crop shortage, a famine occurs, and, on the other hand, if they have a good crop, the surplus may be an entire waste.

Highways and human transport.—For many centuries transportation in China has been done on the backs of men, by pack animals, or by wheeled vehicles and chairs handled by men. It has been estimated that approximately one-third of the total population of China is engaged in some form of transportation. Even lumber and heavy timber are carried long distances on the backs of men, who earn from 25 to 30 cents a day. But such transportation is not necessarily cheap in spite of the low wages; it is often as high as 25 cents per ton mile, or about 10 times the rate on American railroads.

Springless carts, sedan-chairs, and jinrikishas are widely used. In north China the wheeled vehicle is a chief means of transportation. The springless cart is used to a considerable extent on sandy roads, while in central and south China the sedan-chairs are still important. Jinrikishas are in general use in and around the larger cities.

Where pack transportation is available, ponies and mules are used. But in certain sections of Yunnan and over large areas in Szechwan, the coolies' guilds refuse to permit competition from pack animals. Moreover, pack transportation has

been affected adversely by the use of animals for military activities, and owners are now unwilling to bring horses and mules to cities for hire, fearing their loss.

Waterways.—In the transportation schedule of China the waterways are more important than either the railways or highways. The natural routes provided by the Yangtze and its tributaries, and to a lesser extent by the Si Kiang and other rivers of southeast China, bear an enormous amount of domestic traffic. But China's rivers, with the exception of the Yangtze, are unnavigable by ocean-going vessels except in their lower courses. Even the large Hwang Ho is used only by junks, even in its wider seaward parts, mainly because of the prevalence of sand bars and sand accumulations in its channel. The Si Kiang of south China is navigable only to Wuchow (125 miles) for vessels that have more than a six and one-half foot draught.

The Yangtze Kiang, on the other hand, opens the vast interior of China to the sea. It rises in the north central part of Tibet and flows into the ocean near Shanghai, and ranks as one of the great rivers of the world. It consists of three sections: (1) the lower Yangtze, from Shanghai to Hankow; (2) the middle Yangtze, from Hankow to Ichang; and (3) the upper Yangtze, above Ichang. In the lower section of the river, ocean-going vessels may reach Nanking throughout the year; since there is a 24-foot depth at that city even during the low-water season. Between Nanking and Hankow, however, the depth of the river decreases during the low-water season (winter) to such an extent that only river steamers drawing less than 10 feet may navigate the lower Yangtze as far as Hankow. But ocean-going vessels drawing 16 to 18 feet of water come to Hankow during the summer season. The middle Yangtze (Hankow to Ichang) is navigable during the winter season for river vessels drawing less than seven feet. There are many dangers to shipping in both the middle and lower sections of the Yangtze, especially during the high-water season, when steamers sometimes lose their course and strike sand bars or banks. In the upper river, especially in the

Yangtze gorges between Ichang and Chungking, navigation is very dangerous, as reflected in the abnormally high hull insurance which prevails in this section. Here the river bed is cut out of solid rock, and large boulders occur in many places. In addition, the navigation difficulties are enhanced because of strong currents, narrow channels, whirlpools, and frequent rapids.[11] In many cases several hundred coolies must be employed to pull a vessel through sections of rapids.[12]

In addition to the rivers, China possesses an extensive canal system which links up the natural waterways and forms a valuable commercial highway. Thousands of small junks may be found on these canals.

Roads and railways.—A major drawback to rapid industrial development in China is the paucity of modern transportation facilities. Chinese history shows that the highways of the country have been suitable mainly for the use of pack animals, coolies, wheelbarrows, carts, and sedan chairs. But within recent decades the work of famine-relief agencies and military organizations has resulted in a considerable increase in the mileage of roads. At the present time China possesses approximately 40,000 miles of automobile roads. This figure is but little surpassed by the total number (44,000) of automobiles, trucks, and motor cycles which make use of these modern highways. Emphasis, however, should be placed on these developments, for they are associated with the ideas and ideals of a new China.

With a total length of railways of only 6,521 miles, China is poorly supplied with modern rail transportation.[13] The greater part of this railway mileage is found in the Great Plain of north China and in the Yangtze lowland region. In the former region the level topography has greatly facilitated the

[11] Robinson, H. D.: "Shipping on the Yangtze," *Commerce Reports* (July 27, 1931), Washington, D. C., p. 239.

[12] These workers generally pull on long bamboo ropes that are fastened to the vessel.

[13] Most recent figures give more than 10,800 miles of railway line for China, but these take into account the mileage in Manchukuo (4,338 miles in 1930), a unit that is considered separately in this text. See Clark, Grover: *Economic Rivalries in Manchuria,* Yale University Press, New Haven, 1932, p. 18.

construction of railways, whereas the rugged character of south China will always constitute an obstacle to development.

Foreign commerce: trend in exports and imports.—A study of China's foreign trade by 20-year periods from 1870 to 1930 discloses a gradual change in the character as well as value of commodities exported and imported. Thus in 1870 the two giants among Chinese exports were tea and silk. In value these made up nearly 90 per cent of the total exports of the country. During the same period the imports consisted chiefly of only two commodities, opium and cotton goods, the total value of which amounted to nearly 70 per cent of all Chinese imports (Fig. 169). Twenty years later (1890) silk and tea were still the major items on the export list of China, but their proportion to the total value of all exports had become less (a little more than 60 per cent). Similarly, opium and cotton goods were still the leading imports of the country. In another 20 years the export of beans and bean products from Manchukuo had become an important feature of Chinese trade, and by 1910 these ranked second to silk among the exports of the country, tea being third in rank. During the same period (1890-1910), opium had dropped to third place among the imports, being surpassed by cotton yarn and cotton cloth. Silk, eggs, raw cotton, and tea were major commodities on the export trade list in 1930. China's tea had met increasing competition in foreign markets, chiefly from the tea of India and Ceylon; whereas Japan, with its more advanced and more enterprising merchandising methods, had become the chief source of raw silk. Raw cotton had become the leading item of import in 1930, and suggests the changing industrial life of China—a development of her cotton textile industry and an importation of raw cotton to supplement her domestic supply.

Balance of trade.—China has a moderately large import balance of trade. Thus, during the 5-year period from 1927 to 1931, the average annual surplus was some $157,000,000. Since the Chinese buy more than they sell, a deficit results, which must be made up in other ways. The vast numbers of

Chinese living in foreign lands, chiefly other parts of the Orient, constitute a major factor in balancing the trade lists,

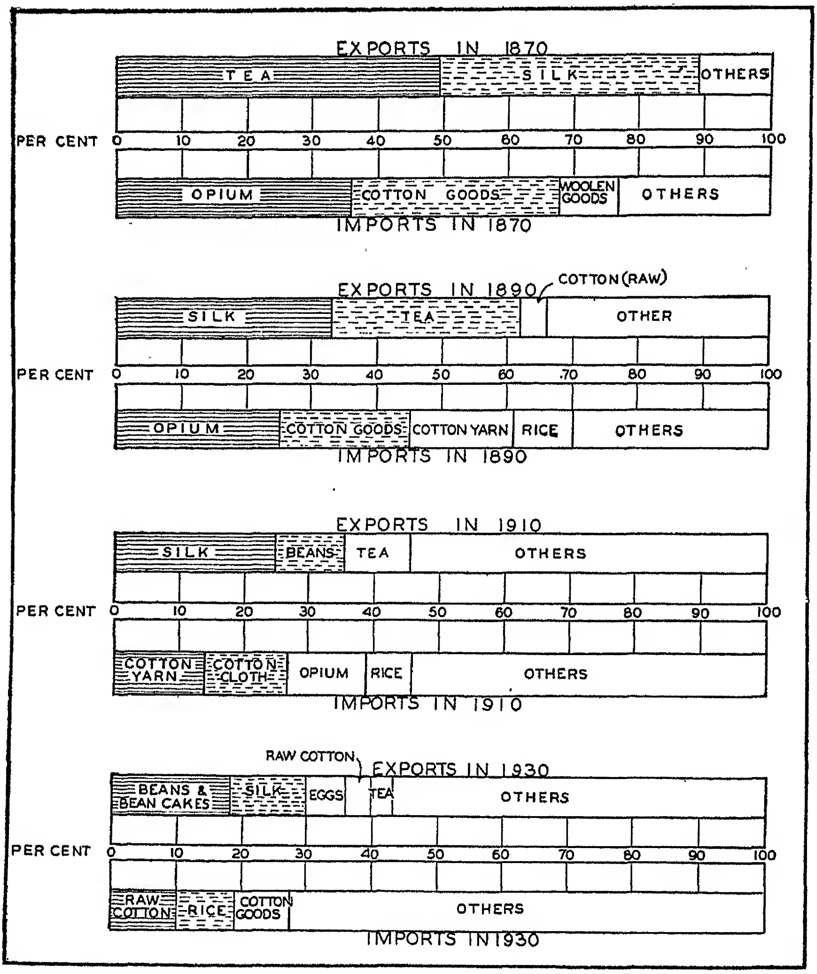

Fig. 169.—Changing merchandise exports and imports of China during twenty-year periods. Note the importance of opium in the early trade and the decreasing percentages of the leading items of import and export.

since the remittances of these over-sea Chinese amount to approximately $100,000,000 a year.[14]

Directions of trade.—China's foreign commerce is con-

[14] Arnold, Julean: "China Trade in Perspective," *Commerce Reports* (November 10, 1930), Washington, D. C.

ducted mainly with Japan, Hong Kong, the United States, the United Kingdom, Germany, France, and India. Japan functions as a primary source of imported cotton textiles and cotton goods, takes Chinese iron, and constitutes a major market for Manchurian soy beans and bean products.

China's trade with Hong Kong is second only to that with Japan. Emphasis must be placed on the fact, however, that Hong Kong is an important entrepot; this commercial center is neither a major producing nor comsuming unit of economic goods. As a free port, it functions mainly in the transit of British goods, but commodities from other countries are also handled at Hong Kong. Thus the United States is a major market for silk produced in the Si Kiang Basin, but this silk first passes through Hong Kong before reaching the American market.

From 1904 to 1930 China's trade with the United States increased from $53,000,000 to $168,000,000. Although these figures reflect a noteworthy increase in trade, they do not take into account the indirect trade, which is moderately large. As has been stated, Chinese silk passes through Hong Kong before reaching the United States. A certain amount of imported merchandise finds its way first to Japan before it enters China.

Chief ports.—The greater part of China's foreign trade is conducted through the ports of Shanghai, Tientsin, Canton, Tsingtao, Hankow, Kowloon, and Swatow (Fig. 170). Tientsin and Tsingtao are major trade channels in north China; Shanghai and Hankow are the chief foreign trade centers in the Yangtze lowland region; Swatow serves the southeastern coastal region; and the ports of Canton and Kowloon are the major trade units of the Si Kiang Basin. The ports of central China or the Yangtze lowlands normally handle approximately 46 per cent of the incoming and outgoing trade; next in rank are the ports of north China (37 per cent); then the ports of the Si Kiang Basin (17 per cent).

The lower part of the Yangtze Valley is favored not only by the river traffic, but also by the coastwise trade of China.

China's commercial life is therefore concentrated to a marked dégree on a single sea gate, the lower Yangtze Kiang; and

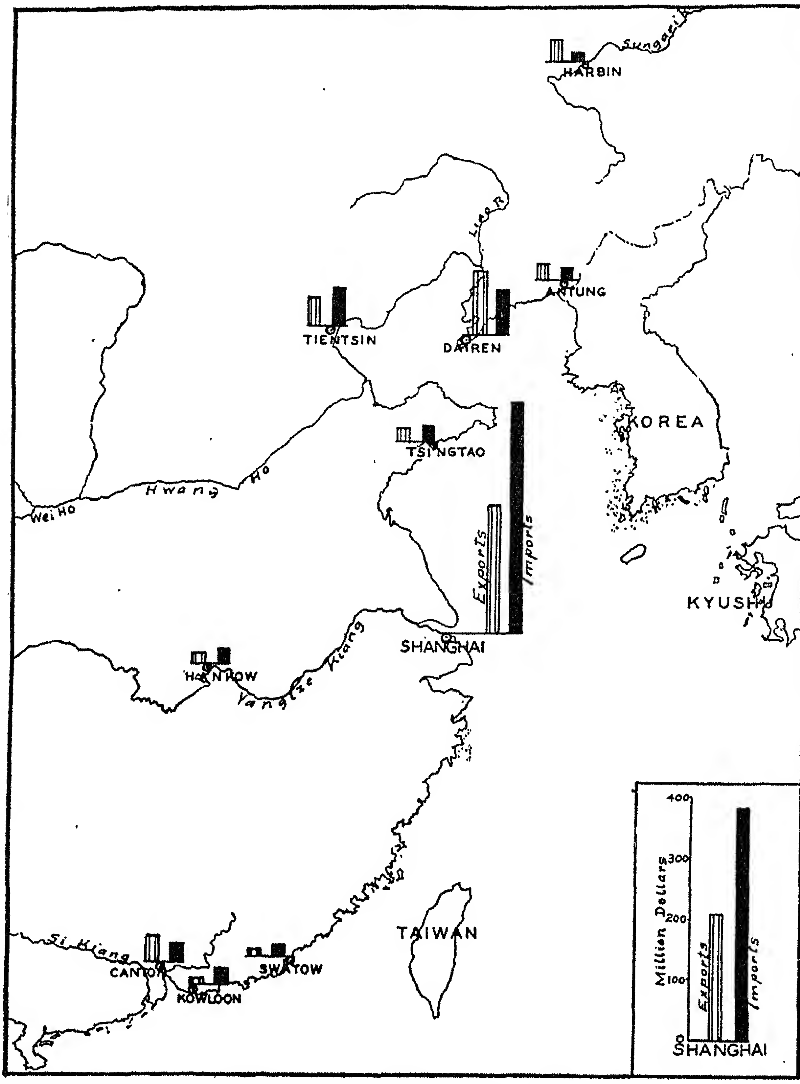

Fig. 170.—**Ten leading ports serving China proper and Manchukuo. Average annual exports and imports for period 1925-1932 in millions of dollars.**

Shanghai, which controls this gate, handles approximately 40 per cent of the foreign trade of the country. In its broader

relations, Shanghai is the most favorably located port in China. It is the nearest large port to Old Japan; and, with a midway location between Tientsin in the north and Hong Kong in the south, it serves as an important center for the coastwise trade. In short, it is the most centrally located port for the trade of a vast realm which includes the fertile monsoonal mainland areas of southeastern Asia and the archipelagoes of the Philippines and Japan.

The outlook.—The changing character of China's trade has already been emphasized. Although cotton textiles are important among the imports, they are also found among the exports; and raw cotton appears as a major import, chiefly from India. Such trade facts indicate the increasing industrialization that is taking place, and the changing character of China's trade. Any rapid development of her world trade will be retarded by a number of factors: (1) the low purchasing power of her masses; (2) the low per capita productive capacity of the Chinese people; (3) lack of good transportation; (4) unstable political conditions; and (5) internal taxes on goods in transit, such as likin. With the development of better means of transportation and communication, it is quite probable that the Chinese would increase their wants as well as the power to satisfy them.

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CHAPTER XXVI

Manchukuo

Distinguishing characteristics.—Manchukuo embraces a roughly triangular area of approximately 460,381 square miles of land.[1] It is one of the few important pioneer units of the world, a land of forests and minerals—a vast agricultural land whose areal extent exceeds that of the entire Japanese Empire by 120,000 square miles (Fig. 171). Approximately equal to the combined surface areas of Wisconsin, Minnesota, North Dakota, South Dakota, and Wyoming, Manchukuo has a climate which somewhat resembles that of the above American States. It varies from the humid continental type in the east to the middle latitude semi-arid type in the west. In addition, the climate of Manchukuo varies from south to north by reason of the great latitudinal extent of the country. Its extreme southern part corresponds in latitude with the southern part of Ohio; whereas the northern point of the country coincides with the latitude of the southern shores of Hudson Bay, Canada. The agricultural life of the southern districts, therefore, contrasts strikingly with that of northern Manchukuo, in which the summers are short and the winters extremely long and cold.

The location of this large agricultural land between the spheres of Chinese, Russian, and Japanese influence is a factor of major importance. It is reflected in the desire by those

[1] As part of China, Manchukuo consists of the provinces of Heilungkiang, Liaoning, and Kirin. In addition, the Chinese province of Jehol, with its 60,000 square miles and 4,500,000 people, has been drawn increasingly within the political orbit of Manchukuo. Japan, however, recognizes Manchukuo as an independent unit, but such recognition is not universal. It appears that Japan will succeed in maintaining Manchukuo as an independent unit. In 1932 provisions were made for a Chief Executive, a Privy Council, and a Cabinet. On March 1, 1934, Mr. Henry Pu-yi was crowned Chief Executive, hereditary Emperor of Manchukuo.

nations for political influence and economic control of Manchukuo. Moreover, by reason of its location, elements of its

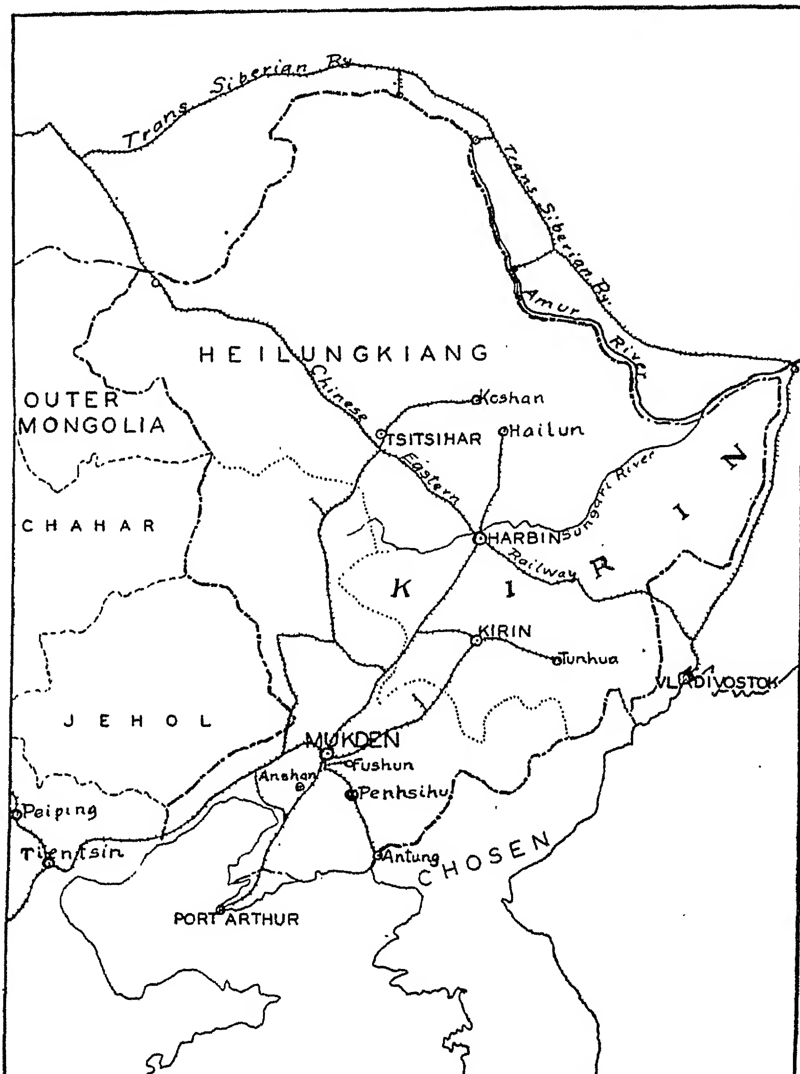

Fig. 171.—Map of Manchukuo showing extent of political units, chief cities, and railways.

population have been drawn from the grasslands of semi-arid and arid Mongolia to the west, from the overcrowded bandit-

ridden, famine-swept provinces of north China to the southwest, from Russia to the north and northwest, and from the densely populated parts of the Japanese Empire (Chosen and Old Japan) on the east. Of these immigrants, the Chinese are by far the most numerous.

Peoples of Manchukuo.—During the last two decades (1914-1934) the colonization of Manchukuo by the Chinese has progressed with remarkable rapidity. It constitutes one of the greatest migrations of peoples known to mankind. This movement traces back to the end of the nineteenth century, when the Manchu Dynasty, in fear of Russian expansion, withdrew its restrictions on Chinese immigration. Later the rapid economic development of south Manchukuo under Japanese influence set in motion a mass migration of accelerating magnitude, chiefly from the densely populated, famine-stricken areas of north China. In fact, the migration since 1927 has averaged more than a million persons annually. Thus in 1900 the population of Manchukuo was approximately 14,000,000, of whom 80 per cent were Chinese, whereas at the present time the country contains about 34,244,980 people, more than 95 per cent of whom are Chinese.[2]

Of the original or native inhabitants in Manchukuo, the so-called Tungus make up the last remnants of the Manchus. These are nomadic people who are engaged mainly in pastoral pursuits. They are found chiefly in the northern highland and in the western semi-arid grasslands of the country.

Of the immigrants, the Koreans rank next in number (600,000) to the Chinese, whereas the Japanese, who have had economic control in south Manchukuo for more than two decades, have not settled in this country to the extent that many people had anticipated. In fact, the Japanese population in Manchukuo has reached the total figure of only 440,000. Twenty-nine years ago (1905) the Japanese Government announced its intention of sending to south Manchukuo one million colonists within a period of ten years. The Jap-

[2] Roxby, P. M.: "The Expansion of China," *The Scottish Geographical Magazine*, Vol. XLVI (1930), pp. 77-79.

anese, however, have not proved to be willing pioneers, being unable to compete with the Chinese who have come to Manchukuo at the rate of more than a million a year. At the present time the Japanese Government and the South Manchurian Railway are financing settlers, and Manchukuo will sell land to them at nominal prices. But in the past the Japanese have shown no great desire to leave their homeland, and they have been disinclined to migrate even into the

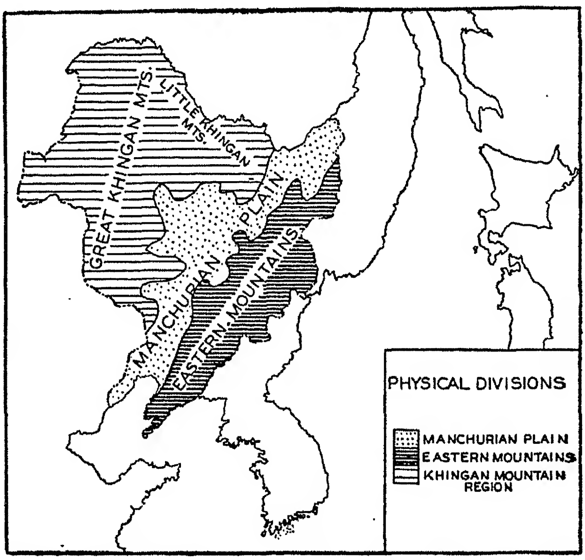

Fig. 172.—Physical divisions of Manchukuo.

peripheral parts of the island empire, unless under artificial stimulus. Many students of the population problem in the Far East are still raising the question whether the home-loving Japanese will move in very great numbers into the pioneer belts of Manchukuo, where the environment is quite similar to that of western Minnesota and the Dakotas of the United States.

Another important immigrant element in Manchukuo is the Russian. Before the Russian Revolution, Manchukuo contained approximately 60,000 Russians. The number today is approximately three times as large as it was at that time,

and it is safe to assume that because of its location, Manchukuo will always have some Russians.

Physical features and climate.—The most important physical feature in Manchukuo is the Manchurian Plain, which consists mainly of the valleys of the Liao and Sungari Rivers and their tributaries (Fig. 172). These alluvial lowlands comprise approximately 120,000 square miles, or somewhat less than one-fourth of the surface area of Manchukuo. They constitute the geographical base of the most intensively utilized agricultural lands and the most densely populated districts of the country. Draining the southern part of this plain, the Liao River flows southward and empties into the Gulf of Liaotung; the Sungari River flows northward and northeastward and empties its waters into the Amur River. The widest part of the Manchurian Plain is in the latitude of Harbin, where the Sungari lowland has a width of approximately 300 miles; whereas the lower part of the Liao Valley is only 75 miles wide. In contrast to the Great Plain of north China, which is the product of deposition, the Manchurian Plain has resulted from long-continued erosion. It, therefore, is more broken in appearance, has extensive terraces, and, in general, lacks the extremely level land surface which characterizes the Great Plain of China.

Highlands enclose the Manchurian Plain on the west, north, and east. In the west and north the Khingan Mountains (Great and Little Khingan Mountains) comprise the largest geographical region in Manchukuo. The Great Khingan Mountains in the west constitute a divide between the Manchurian Plain and the Mongolian Plateau. The Little Khingans extend almost at right angles to the former highlands. Both highland regions are sparsely populated areas in which crop production is narrowly limited by unfavorable climate and rugged relief. The Great Khingan Mountains have their greatest relief on the slopes facing the Manchurian Plain; the least on the slopes that extend westward into Mongolia. In certain places the Mongol nomads take their cattle and sheep into the western parts of this region. Minerals and

forests remain as potential reserves, awaiting future development. The forests consist mainly of larch, birch, and oak—the larch being the most widespread and important. These forests, however, are scattered and decrease in size from east to west. Some of the northern districts of the Great Khingan forests are but little known. In general, these northern forests, together with the forests of the Little Khingan Mountains, are quite similar to the neighboring forests of Siberia. Gold constitutes another significant resource in these highlands, especially placer gold, which is obtained in the northern and southern parts of the Little Khingan Mountains—from the tributary valleys of the Amur on the northern slope and those of the Sungari in the southern part of the region.[3]

Along their eastern margins the plains of Manchukuo are bounded by another belt of highlands—the mountains of eastern Manchuria. With a total surface area of approximately 100,000 square miles, this eastern region of Manchukuo has a greater amount of rainfall and contains much larger stands of timber than do the Khingan Mountains. In fact, this region comprises one of the largest stands of timber in the Far East. Moreover, in contrast to that of the Khingan Mountains, agriculture is well developed in many of the southern districts of the region. Thus in spite of the isolation and inaccessibility which characterize much of this Eastern Mountain region, the population has increased to approximately four and a half million. Some of Manchukuo's largest reserves of coal are located within this region, and it is a source of large quantities of ginseng.

These three major geographical divisions of Manchukuo—the Khingan Mountains, the Manchurian Plain, and the Eastern Mountains—show contrasts not only in topography but also in climate. In addition, the climate varies from place to place within a certain region. The highest precipitation records for Manchukuo are found in the southeastern part of the Eastern Mountains, where some districts have more

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[3] Torgasheff, Boris P.: "Gold Mining Prospects in Manchuria," *Chinese Economic Journal*, Vol. IV (1929), pp. 135-153.

than 35 inches a year. On the other hand, the average annual precipitation is less than eight inches in the extreme western parts, the districts that are located near the Mongolian boundary. In the Manchurian Plain the precipitation decreases from east to west—a decrease from more than 24 inches in the east to 16 inches in the west.

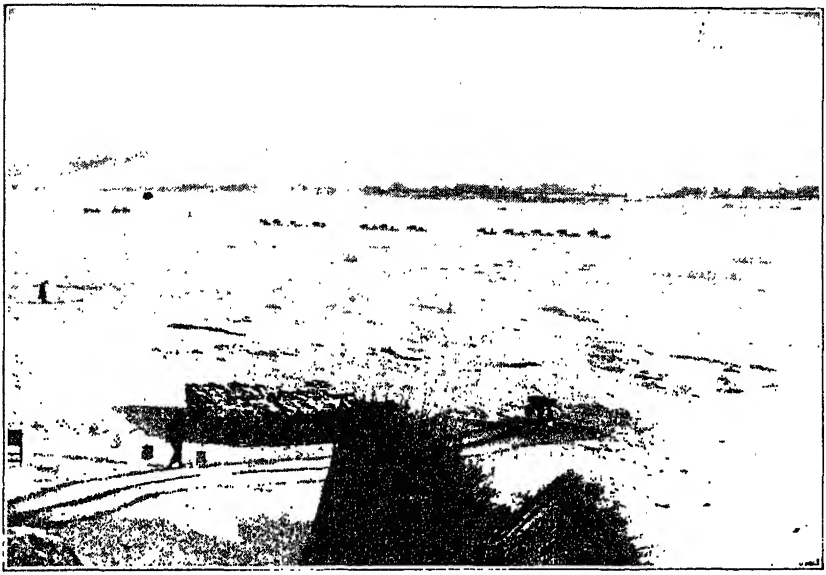

Fig. 173.—Winter scene of the Sungari River, near Kirin. (Courtesy South Manchuria Railway Co.)

Just as precipitation decreases chiefly from east to west, so temperatures and length of frost-free period decrease from south to north. The isohyets therefore cross the isotherms. The Manchurian Plain south of Harbin has a frost-free period of more than 150 days; whereas some of the northern interior districts of the Great Khingan highland area have less than 100 frostless days. Moreover, the northern part of Manchukuo experiences extremely low temperatures during the winter season (Fig. 173). At Harbin the average temperature during January, the coldest month, is approximately 0°F., comparing quite favorably with the average January temperature at

Winnipeg and adjacent districts in Canada. To the north of Harbin the winters are even more severe.

On the basis of seasonal temperature conditions and the length of the frost-free period, two major subdivisions may be recognized—north Manchukuo and south Manchukuo. The north is a region of short summers, and long severe winters. Northern Manchukuo has the humid continental type of climate with short summers, or the so-called "spring Wheat Belt type of climate"; whereas the southern region of the country possesses the humid continental climate with long summers, a climatic counterpart of the Corn Belt region of the United States. As compared with south Manchukuo, the northern region is more of a frontier land, where agricultural holdings are larger and more widely scattered. Its land utilization contrasts strikingly with that of south Manchukuo. Thus the northern frontier region receives approximately two-thirds of the immigrants.[4]

Land utilization.—Although agriculture is the dominant activity and the chief source of wealth in Manchukuo, the crop land constitutes only 13.2 per cent of the total area of the country. The remaining land consists of forests (36 per cent), pastures, and waste. The cultivated acreage has increased from 12,800,000 acres in 1915 to 32,300,000 acres in 1930. Various surveys have disclosed the fact that the crop land may be further increased by an amount of approximately 22,500,000 acres, or 9.3 per cent of the total surface area of the country. Hence, 22.5 per cent of the total area of Manchukuo may be brought under cultivation.

Agricultural development.—The most complete utilization of agricultural land in Manchukuo is found in the southern part of the Manchurian Plain. This part of the country is favored with a long growing season and a good supply of rainfall. Moreover, it is served by a better system of roads and railways than one will find in other parts of the country.

The cultivated land of Manchukuo is devoted chiefly to the

[4] Young, C. W.: "Chinese Colonization in Manchuria," *Far Eastern Review*, Vol. XXIV (1928), pp. 241-250 and 296-303.

following crops: (1) soy beans; (2) kaoliang; (3) millet (common and Italian); (4) wheat; (5) maize; and (6) rice. These crops are not equally important in all of the cultivated districts of the country. Thus rice and maize occupy relatively large proportions of the crop area in south Manchukuo, whereas wheat production is confined chiefly to the central and northern parts of the country. Kaoliang is widely cultivated. It occupies more than half of the cultivated land in

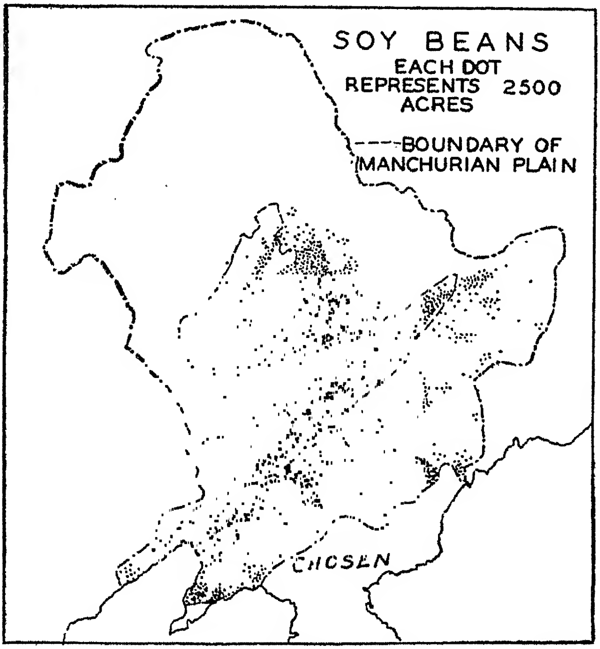

Fig. 174.—Dot distribution map showing soy bean acreage of Manchukuo. (Data according to consular reports from Dairen and plotted according to Murokoshi and Trewartha, with modifications.)

some of the southern districts of the Liao Plain; whereas less than 10 per cent of the crop land is devoted to this cereal in the Khingan Mountain region of the north.

As the most important and distinctive crop of Manchukuo, soy beans occupy more than 25 per cent of the cultivated land (Fig. 174). In fact, Manchukuo has been called the "Soy Bean Empire of the World," and normally produces more than one-

half of all the beans of commerce. Soy beans are produced in all parts of China, but it is only in Manchukuo that they are extensively grown for the export trade. It is the chief cash crop of the country. One-fourth of the crop is normally consumed locally, whereas the remainder is available for export.

The uses of soy beans are many. They constitute an important food for man and beast as well as a major source of oil. The oil is used not only for food, but also in the manufac-

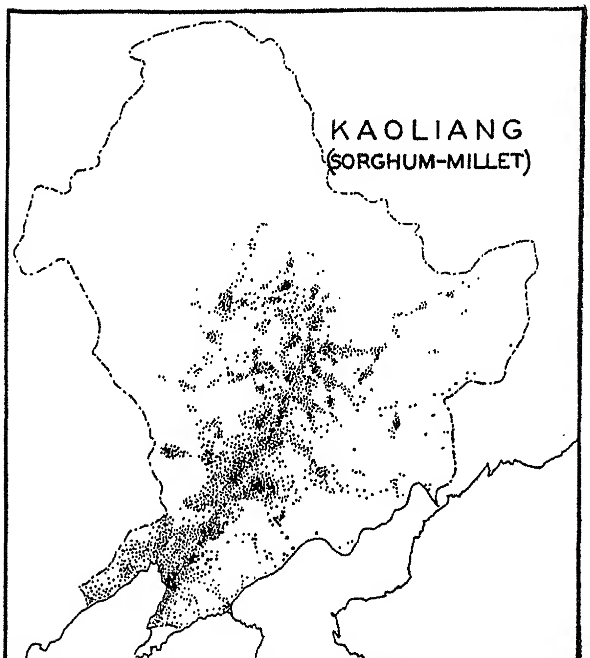

Fig. 175.—Dot distribution map of the kaoliang acreage of Manchukuo. Each dot represents 2,500 acres. (Data according to consular reports from Dairen as well as Murokoshi and Trewartha.)

ture of paints and enamels. The residue which remains after the extraction of the oil is made up into bean cakes. These are exported to other countries at the rate of approximately $30,000,000 worth a year, chiefly to Japan. If the Japanese can obtain more food from their crop lands through more intensive agricultural practices, including the use of bean cake fertilizer, they will be better able to care for their increase

in population. In fact, various students of Japan's population problem feel that the uninterrupted flow of the products of the broad fields of Manchukuo is of fundamental significance to Japan.

Kaoliang ranks next to soy beans in acreage and production (Fig. 175). Before the rapid development of soy bean culture, kaoliang was the leading crop of Manchukuo. As a leading staple food of the farming classes and a major feed for ani-

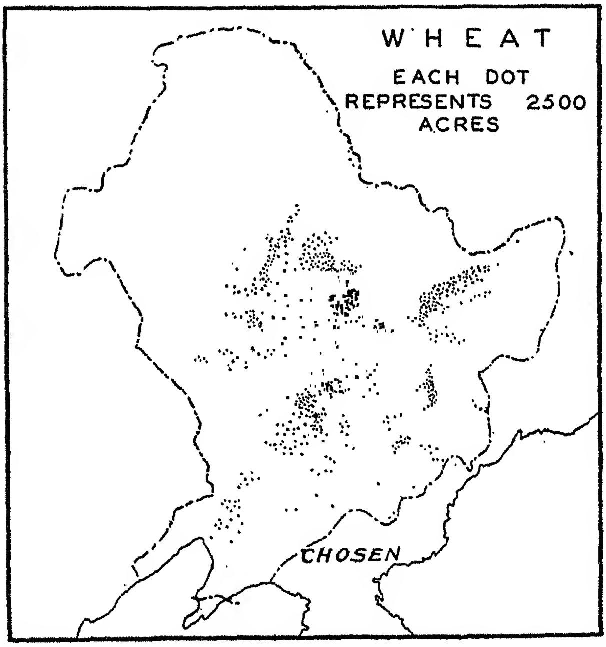

Fig. 176.—The wheat acreage of Manchukuo. Note the general paucity of wheat in south Manchukuo. (Data from consular reports from Dairen and plotted according to Murokoshi and Trewartha, with modifications.)

mals, it occupies 19.2 per cent of the crop land. In addition, kaoliang stalks are used for fuel, for building material, and for the making of mats. It withstands drought as well as flood better than does maize, which accounts for its widespread cultivation in north China as well as in Manchukuo. As Chinese immigrants have come in increasing numbers from China, the kaoliang production has increased, especially in south Man-

chukuo. It should be emphasized that the land utilization in south Manchukuo suggests similarities with that of north China, whereas northern Manchukuo is more of a frontier land, much of which is as yet undeveloped. The latter area is similar in certain respects to the North Central States of the U. S. and the Prairie Provinces of Canada.

Millet is second only to kaoliang among the staple food crops of the Manchurian people. Since it can withstand cold

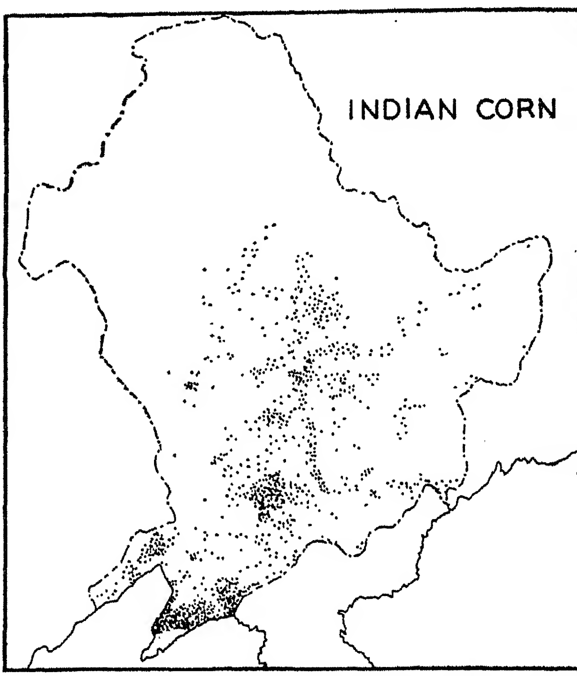

Fig. 177.—Geographical distribution of Indian corn (maize) in Manchukuo. (Data plotted according to Murokoshi and Trewartha, with modifications.)

weather and poor soil conditions better than kaoliang, it is the main crop of the people of the north. Like kaoliang, it is a general utility crop; it is used as food for man and a feed for animals, as well as a basic material in the making of liquor.

Ranking next to millet in acreage, wheat occupies nearly 11 per cent of the total cultivated land of Manchukuo (Fig.

176). Unlike soy beans, kaoliang, and millet, which are widely distributed in the Manchurian Plain, wheat is found chiefly in the central and northern parts of that region (Fig. 176). The production of approximately 60,000,000 bushels suggests the fact that this large potential wheat-producing region has only begun to realize the possibilities of growing wheat. Production will increase with further occupancy of the area and the development of transportation facilities.

The chief maize or Indian corn-producing districts are located in southern Manchukuo (Fig. 177). In many places maize replaces kaoliang and millet, and like the latter crops it is used as food and feed as well as for fuel.

Rice is grown in various parts of southern Manchukuo. It is cultivated chiefly by Korean immigrants who have come from rice-producing parts of Chosen. The immigrant Chinese, however, are neither rice producers nor rice consumers; most of these people have come from north China, a land of winter wheat, kaoliang, millet, and pulses rather than rice.[5]

In many of the southern districts of Manchukuo the natural environment has favored the development of fruit industries. Among the fruit crops, pears, apples, peaches, apricots, and cherries are noteworthy. Vineyards are also widely developed and very productive in many parts of south Manchukuo.

The livestock of the country consists chiefly of cattle, sheep, hogs, and poultry. Although most of the sheep have an inferior grade of wool, the quality is being improved by crossbreeding the native animals with high grade imported stock. The cattle of Manchukuo are raised not only for their meat, but also for use as draft animals.

Wild silk.—The production of wild silks (tussah silk) is a supplementary occupation to agriculture in some parts of Manchukuo, chiefly in the vicinity of Antung. The yellow wild silk of Manchukuo, like that of Shantung, China, is obtained with but little care of the silkworms; they feed on the

[5] Murakoshie, Nobuo, and Trewartha, Glenn: "Land Utilization Maps of Manchuria," *Geographical Review,* Vol. XX (1930), p. 483.

foliage of the native oak rather than the leaves of the cultivated mulberry. Most of this silk finds a market in Shantung, where it is used in the making of pongee.

Utilization of forest resources.—With a total forest area of approximately 88,800,000 acres, Manchukuo has a potential stand of timber of nearly 150,000,000,000 cubic feet. Much timber has already been cut in the Manchurian Plain, where land has been cleared for agriculture. Logging operations have been extended into the highlands. One of the chief regions of timber exploitation at the present time is that of the valley of the upper Sungari River, which is located in the Eastern Mountains of Manchukuo. The largest remaining stands of timber in Manchukuo are found in the highlands of the country. The Great and Little Khingan Mountains contain stands of larch, birch, and oak, the larch being suitable for railroad ties and buildings. The timber in these western and northern highlands, however, is not so large as that of the more humid Eastern Mountain region of Manchukuo. In the latter region, Korean pine, spruce, larch, elm, and birch are the principal trees. Korean pine is the chief type of timber cut in the region at the present time.

Utilizing the mineral resources.—Manchukuo contains a variety of minerals, of which coal, iron, and gold are most important. The total mineral reserves are not known with scientific accuracy, since large areas of the country have not been surveyed. Resources of some regions, however, are well known, especially in south Manchukuo. In 1925, C. Y. Hsieh estimated that Manchukuo possessed nearly 3,000,000,000 out of China's 217,000,000,000 metric tons of coal. In 1932 the estimate of Wong and Hou placed the Manchurian reserve at approximately 4,000,000,000 tons out of a total of 246,000,000,000 tons for all of China. On the basis of these estimates, the Manchurian coal reserve is but a small fractional part as large as that of China. Yet Manchukuo produces approximately one-third of the coal mined in all of China.

South Manchukuo is the major coal-mining region of the country, with an average annual production of more than

9,000,000 metric tons out of the total of approximately 10,000,000 tons for all of Manchuria. The Fushun mine is the chief producing unit, with 6,864,000 tons in 1930. Located in south Manchukuo, 20 miles to the east of Mukden, the Fushun district contains very heavy seams of coal and a potential reserve that has been estimated at 1,200,000,000 metric tons (Fig. 178). Here the chief coal-bearing rock series consists of shale. In addition, there is a heavy overburden of oil shale.

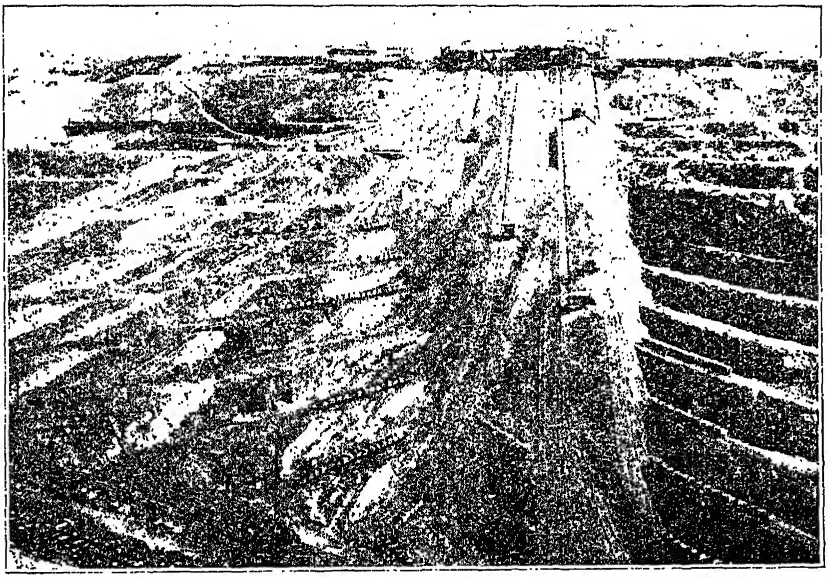

Fig. 178.—Open cuts at the Fushun collieries. (Courtesy South Manchuria Railway Co.)

South Manchukuo contains two major coal mines which are located to the south of Fushun—the mines of Penhsihu and Yentai. The Japanese owned Yentai mine lies approximately 40 miles to the south of Mukden. Yentai coal is low in volatile substances and high in ash content. The Penhsihu mine is located along the South Manchurian Railway between Mukden and Antung. This district produces large amounts of coke for the iron and steel works at Anshan.[6]

[6] Bradley, J. R.: "Fuel and Power Resources of Manchuria," *Commerce Reports* (March 21, 1932), Washington, D. C.

North Manchukuo contains large reserves of coal, but production is less than a million tons a year. The mines at Chalainor, Mulin, and Hokang account for the greater part of the output of this northern region. The Mulin mine is located in the eastern part of the region, and it is connected by rail with the eastern line of the Chinese Eastern Railway. The Chalainor mine is located in the extreme western part of northern Manchukuo on the Chinese Eastern Railway near

Fig. 179.—Anshan Iron Works. The Takushan iron ore mines. (Courtesy South Manchuria Railway Co.)

the Russian frontier. The Hokang mine is situated in northern Heilungkiang, near the Sungari River.[7]

Manchukuo possesses approximately 738,000,000 metric tons of iron ore. The greater part of this reserve consists of low grade ore in which the metallic content varies from 30 to 36 per cent. The actual iron content of this reserve is therefore no more than 259,000,000 metric tons. Iron mining centers at Anshan and Miao-erh-kou in south Manchukuo. Anshan iron ore is utilized by the Anshan Iron Works, whereas the Penhsi-

[7] Torgasheff, Boris P.: "The Three Largest Coal Fields of North Manchuria," *Chinese Economic Journal*, Vol. II (1928), pp. 26-35.

hu Iron Works draw upon Miao-erh-kou iron ore (Fig. 179).

Gold mining is an old activity in Manchukuo. It is still important in some districts, chiefly along the northern and southern slopes of the Little Khingan Mountains, where this metal occurs chiefly as placer gold. Some placer gold is also mined in several districts of the Eastern Mountain Region.

Manchukuo, like China proper, lacks important reserves of petroleum. In Manchukuo, however, oil is obtained from the shale that rests upon the coal seams at the Fushun mine. Estimates place this reserve at approximately 5,300,000,000 tons of oil shale, with an oil content of six per cent. The shale-oil plant at Fushun has an annual capacity of 1,360,000 tons of shale and an estimated production capacity of 69,000 tons of oil. However, only 3,617 metric tons of shale oil were produced in 1930. Although the extraction of oil from shale is not considered a profitable business in regions which contain petroleum reserves, the quarrying of shale is a process of coal mining at Fushun, and the Far East lacks large reserves of petroleum.

Manufacturing.—As in China, so in Manchukuo, the household industries are widespread. Yet the modern factory system has become a fundamental part of the economic structure of the country. Factories using machinery and steam power were introduced in 1902, when the Russians organized a few pioneer flour mills in Harbin. Later years have witnessed a rapid development of the flour-milling industry by the Chinese and Japanese at various important trading centers; such as, Mukden, Harbin, Dairen, Changchun, Fushun, Tiehling, and Liaoyang.

A number of other modern industries in Manchukuo base their development in large part on the local supply of raw materials. Of these the business of extracting oil from soy beans and the making of bean cake fertilizers is distinctive. Although the major part of the output comes from large, modern presses, there are also many old-style native presses using animal and man power in order to extract the oil from the beans.

Other modern industrial establishments in Manchukuo include cotton mills, tanneries, silk filatures, sugar refineries, soap and candle factories, and iron and steel works. In addition, a number of minor industries are engaged in the making of cheap pottery, cigarettes, confectionery, felt carpets, and tinware.

The blast furnace industry.—Special mention should be made of the blast furnace industry of Manchukuo, since the

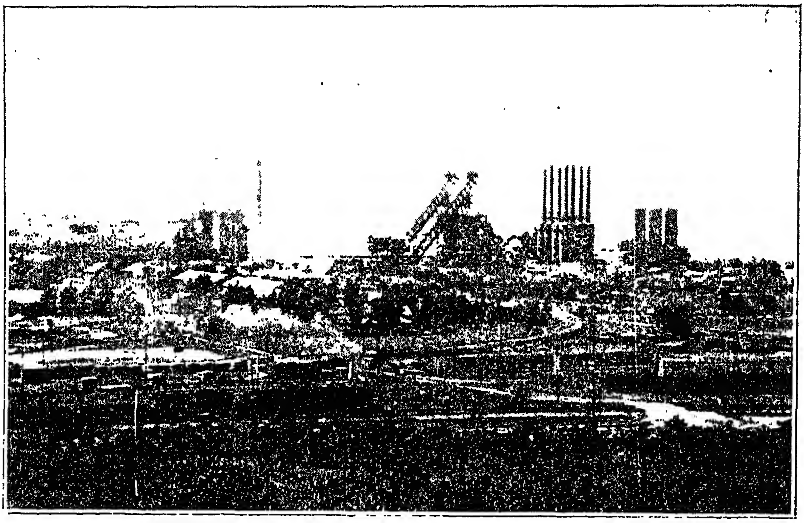

Fig. 180.—Anshan Iron Works. (Courtesy South Manchuria Railway Co.)

iron ore factor is frequently mentioned in connection with Japanese intervention in that country. Moreover, the fact that Manchukuo possesses a very large iron ore reserve, whereas Japan has but narrowly limited reserves of this metal, would seem to suggest the dependent position of Japan's iron and steel industry upon the iron of Manchukuo. The actual annual importation of Manchurian iron into Japan, however, is frequently overstated, and the unprofitable operation of the Manchurian industry is commonly overlooked. Moreover, Manchukuo exports pig iron and not iron ore (Figs. 180 and 181). Japan imports nearly all of this pig iron.

Although there are a few million tons of high grade iron

ore in Manchukuo, these ores are intermingled with the low grade ore to such an extent that concentration, crushing, and roasting operations become essential before they can be converted into pig iron. Most of the easily available ores of Manchukuo possess a low metallic content and a high proportion of silica. These ores are therefore crushed, the silica being removed from the iron. This operation is followed by roasting of the ore and a process of magnetic concentration, which

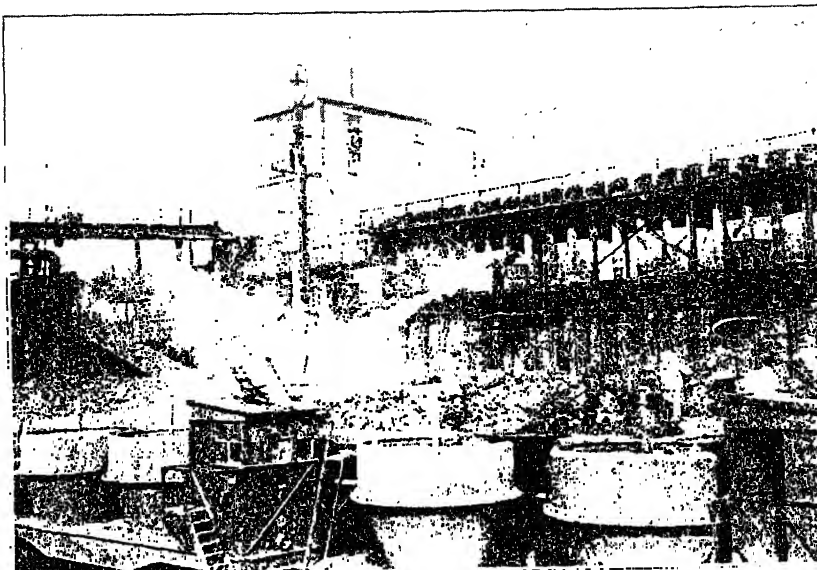

Fig. 181.—Coking at Anshan Iron Works. (Courtesy South Manchuria Railway Co.)

finally prepares the ore for smelting. These operations add materially to the costs of producing pig iron in Manchukuo.[8]

The cost of this pig iron is further enhanced before it is laid down in Japan, mainly because of the following reasons: (1) rail freight to Dairen; (2) handling and loss in transit; (3) transportation charges to Japan; and (4) Japanese import duty. In fact, on the basis of comparative costs, the Kamaishi Iron Works of northern Hondo have been able to

[8] Palmer, J. J. W.: "Iron and Steel in Manchuria," *Commerce Reports* (Dec. 28, 1931), Washington, D. C., pp. 734, 735.

produce pig iron in recent years at slightly lower costs than the Manchurian product. Yet the cost of the Manchurian pig iron compares quite favorably with the costs of producing pig iron at the Yawata Steel Works of Kyushu. Since Japan draws heavily upon some of the higher grade iron ores of the Yangtze Basin of China, and upon the ores of Chosen as well as of the Malay Peninsula, the Manchurian pig iron meets competition from these diverse sources. Thus in 1930 Japan

Fig. 182.—Soy beans in open storage, awaiting shipment at one of the produce centers in Manchukuo. (Courtesy South Manchuria Railway Co.)

imported only 223,000 metric tons of this metal from Manchukuo.

Transportation and trade.—Manchukuo has 4,338 miles of railway line. In addition there are many single lines that are of little economic importance. The three chief systems which serve the country are: (1) the Japanese owned and controlled South Manchurian Railway, which extends from Dairen through Mukden to Changchun and from Mukden to Antung; (2) the Chinese-Peiping-Mukden line which connects north

China with the Manchurian system; and (3) the Chinese Eastern, essentially a branch of the Trans-Siberian Railway which extends to Vladivostok. At the present time this railway is owned by Manchukuo.

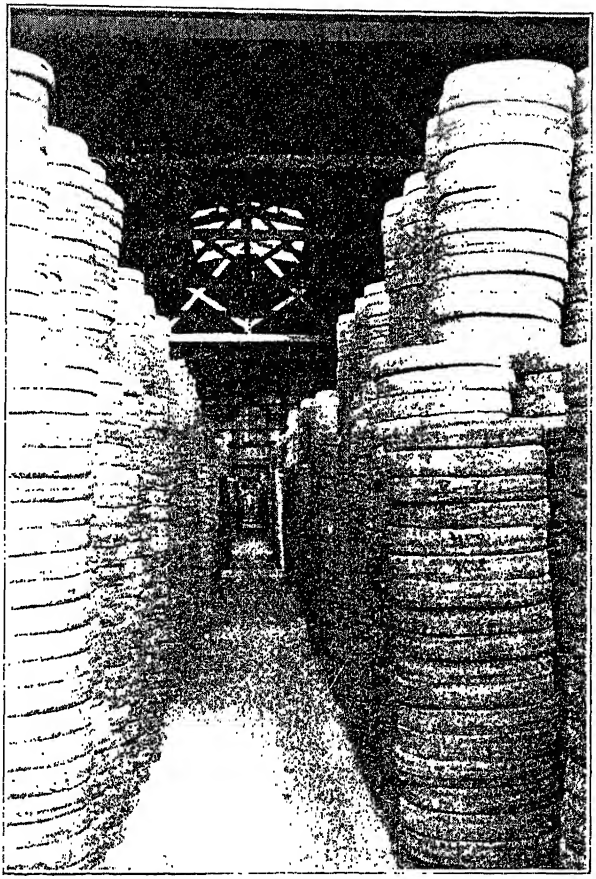

Fig. 183.—Bean cakes in storage at Dairen Wharves. (Courtesy South Manchuria Railway Co.)

As in China proper, so also in Manchukuo, economic development has been greatly retarded because of the absence of a good road system. In many places the roads become impassable during the season of rains. The Sungari and Liao Rivers supplement the roads as channels of trade, but they are ice-bound during the cold winters of Manchukuo.

A study of Manchuria's foreign commerce discloses the fact that soy beans and their by-products account for more than 50 per cent of the total exports of the country (Figs. 182 and 183). Other exports include millet, kaoliang, coal, tussah silk, timber, and pig iron. On the other hand, the imports consist mainly of cotton piece goods, kerosene and lubricating oil, sugar, machinery, bags, and tobacco products.

The greater part of this foreign commerce is handled through the ports of Dairen, Newchwang (Yingkow), and

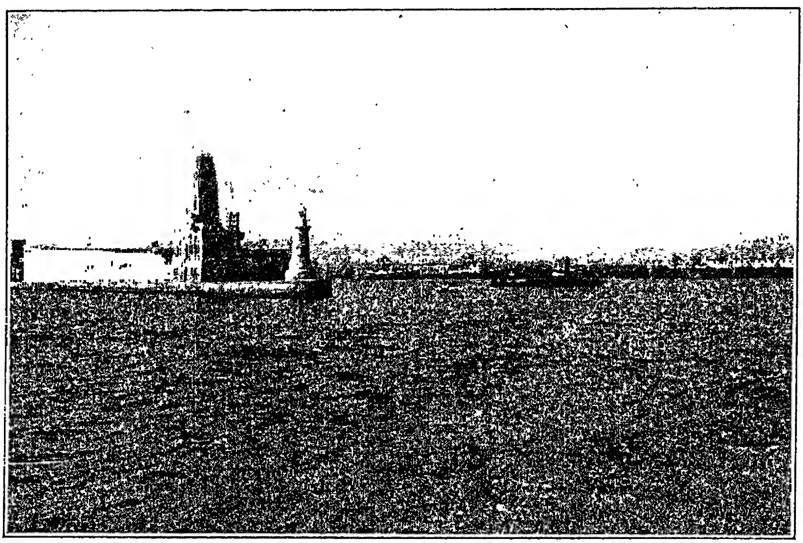

Fig. 184.—Entrance to Dairen Wharves. (Courtesy South Manchuria Railway Co.)

Antung (Fig. 184). As the southern terminus of the South Manchurian Railway, Dairen has become one of the largest foreign trade centers of the Far East.

The political factor and natural environment.—By reason of its location, Manchukuo is of great concern to the adjacent spheres of political influence—Chinese, Japanese, and Russian. It has been called "the coveted land of the Orient," "the tinder-box of Asia," and "the prize of the Far East." To Russia, Manchukuo is of much interest, chiefly because of its geographical situation and ice-free ports in the south. Russia,

with its extensive continental sweep, has always sought favorable coastal regions. To China, Manchukuo means land for her surplus millions. These constitute the greater percentage of Manchukuo's present population, and in recent years they have entered the country to the extent of more than a million a year, chiefly from the bandit-ridden, famine-stricken districts of north China. To Japan, Manchukuo is a land of valuable resources, in the exploitation of which large amounts of Japanese capital have already been invested. Lacking sufficient domestic food for her rapidly growing population and various raw materials essential for her industries, Japan must assure herself access to food supplies and resources. She must also have assured access to markets in which to dispose of her manufactured goods. The present Japanese population in Manchukuo does not seem to indicate any great desire on the part of the Japanese to leave their homeland for these frontier lands.

Although Manchukuo was established as a pseudo-independent state by Japan in 1932-33, foreign powers in general do not recognize it as a separate nation. As an independent unit Manchukuo should be of value to all the adjacent countries. It should be of value to China as an agricultural land awaiting further settlement. It should prove of value to Russia as a transit region. Japan will find there a variety of natural resources and foodstuffs as well as markets for manufactured goods.

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Part VI

NORTHERN ASIA, AND THE FUTURE OF THE CONTINENT

CHAPTER XXVII

Siberia and Russian Turkestan

SIBERIA

Human occupancy.—With a population estimated at approximately 15,000,000 and an area of 5,200,000 square miles, Siberia is one of the large land masses of the world awaiting further development. The present population consists mainly of Russian settlers and natives. The indigenous peoples number somewhat more than 2,000,000 and comprise diverse groups living in various parts of this vast realm. In the extreme northeast of Siberia the Chukchis, Koriaks, and Kamchadales are engaged as hunters, fishermen, and reindeer breeders. These occupations are also followed by the Samoyeds and Finns of northwestern Siberia. The Tungus are widely distributed over eastern Siberia and are mostly hunters. The Buriats live in the Lake Baikal region, keep livestock, and raise crops. The Yakuts of the Lena River Basin and the Tartars of southwestern Siberia keep herds of livestock.

Most of the people of Siberia, however, are European Russians or their descendants, who are engaged mainly in agriculture. Following the armed conquests of the Siberian area during the sixteenth century, the Russian farmers pressed eastward into the wilderness of this vast domain. In contrast to the westward movement of the frontier in the United States, the migration of peoples has been eastward in Siberia. Instead of fighting Indians, the Russian farmers had their quarrels with Tartars, savage nomads, and other indigenous peoples of Siberia. The era of rapid settlement, however, did not begin until the latter part of the nineteenth century. In the 20-year period 1895-1915, Siberia received approximately 5,000,000 Russian colonists, or more than the entire Russian coloniza-

tion during the three preceding centuries.[1] The completion of the Trans-Siberian railway was a major factor in stimulating the inflow of settlers, especially in the black-soil belt along this line (Fig. 185).

With respect to the future occupancy of this large country, a number of factors should be considered. In the first place, some areas are better suited than others as human use regions. Secondly, it has been estimated that only one-fourth of Siberia, or 1,300,000 square miles, is suitable for colonization. In the

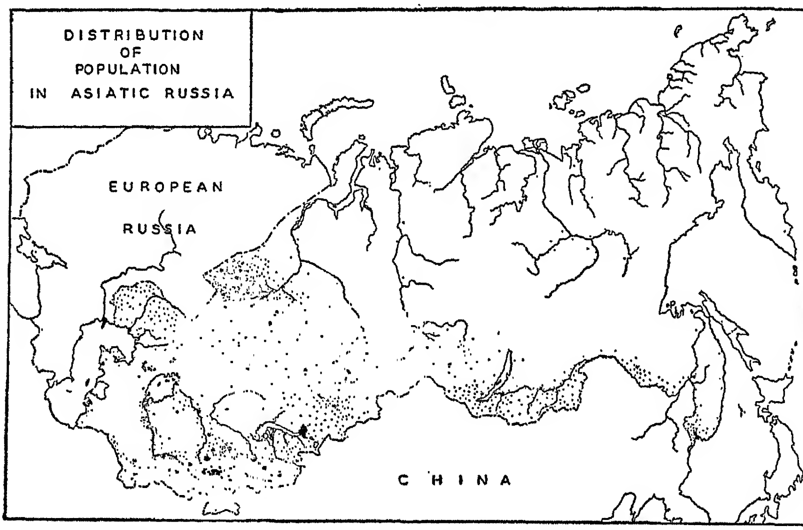

Fig. 185.—Dot distribution map of population in Asiatic Russia, based on recent statistics. Each dot represents 10,000 people. The population of Russian Turkestan as well as that of Siberia is shown on the map.

third place, Siberia is part of the Union of Soviet Socialist Republics and is affected by the various policies of that Union, including the economic system of five-year planning; the Second Five-Year Plan is in effect at the present time. In the fourth place, the increasing industrialization of Russia in recent years and the demands for basic raw materials have brought heavy industries into Siberia, as for example iron and steel manufactures in the Kuznetzk Basin. Since the Second

[1] Baievsky, Boris: "Siberia—Its Resources and Possibilities," *Trade Promotion Series,* No. 36, Department of Commerce, Washington, D. C., 1926, p. 9.

Five-Year Plan calls for an increase in coal production from approximately 90,000,000 tons in 1932 to an average annual output of 112,000,000 tons by 1937 (last year of Second Five-Year Plan), and since plans have been made to increase considerably the output of the heavy industries, the mineral industries of Siberia are providing employment for increasing numbers of people.

The natural environment.—A study of the natural environment discloses more completely than any other line of investigation the future possibilities of various major occupations in Siberia. Thus climate, soil, topography, and native vegetation vary from place to place and cause diversity in the agricultural occupation. Tundra in the north and mountains in the south further limit the cultivable area. Some districts are well supplied with basic minerals and forest resources; others are lacking in these essential raw materials. Thus, a number of natural environment regions may be recognized; such as, tundra, northern coniferous forest, black earth belt, steppe, desert, and highlands.[2]

The tundra.—Located in the extreme northern part of Siberia, the tundra occupies an extensive east-west trending belt. Here the winters are too long and the soil temperatures of summer are too low to permit the growth of trees, except in protected southern districts and along the margins of the northern coniferous forest. The ground is everywhere frozen to a considerable depth during the greater part of the year, and it thaws out only in the upper foot or two during the short summers (two to three months).

Although the short Tundra summers are characterized by an abundance of sunshine, the angularity of the sun's rays is such that relatively little heat is obtained per unit area. On June 21 at 66½° N. the sun shines continuously for a period of 24 hours. At 70° N. there is a continuous period of sunlight for 73 days. This continuity of sunlight makes possible a

[2] Marbut, C. F.: "Agriculture in the United States and Russia—A Comparative Study of Natural Conditions, *Geographical Review,* Vol. XXI (1931), pp. 598-612.

great variety and luxuriant development of quickly-maturing species of plants. The cumulative effect of heat and light upon various kinds of plant life has been proven repeatedly. Thus, although the Tundra lacks any extensive tree cover, there are many species of mosses, lichens, flowering plants, perennial herbs, and small bushes. The only trees found well within the Tundra are dwarf birches, which attain a height of but a few inches. In the low moist places moss predominates, whereas the lichens cover the earth in the dry districts.

The greater part of the Tundra of Siberia has a precipitation of less than 10 inches a year, or a precipitation record characteristic of deserts. Yet by reason of the low temperatures, evaporation proceeds slowly, and the land surface generally reflects a plentiful supply of moisture. The frozen substratum prevents drainage downward into the underlying materials; hence the soil in many districts is saturated with moisture.

Among the animals of the Siberian tundra one finds the lemming, arctic foxes, polar bears, reindeer, and polar partridges. In the coastal districts water fowl and long legged waders occur in large numbers, chiefly during the periods of spring and summer. In the waters of the Arctic, seals and walruses find a suitable habitat, but sea beavers and fur seals have become almost extinct owing to the long-continued exploitation of these fur-bearing animals. The wolf, bear, ermine, and weasel are found in the tundra. They prey upon other types of animals.

As a human use region, the tundra will never contain agricultural communities. Valuable minerals are unknown, and commercial timber is lacking. The region is occupied mainly by natives who are engaged in herding reindeer, hunting, trapping, and fishing. Compelled to wander from place to place, most of the inhabitants of the region are nomads. Some of them catch sea birds and fish at the mouths of Siberian rivers and along the shores of the Arctic; others devote their time to trapping and hunting. Most of them keep herds of reindeer, which help make their economic life less precarious than that of their neighboring fishermen and hunters. The

reindeer thrive on the mosses, lichens, herbs, and grasses of the tundra. They draw sledges and furnish milk and meat. In the future the tundra must remain, as now, a sparsely populated land.

Northern coniferous forest.—Located south of the tundra, the northern coniferous forest is the largest human use region of Siberia. Here the forests are usually known as "taiga,"

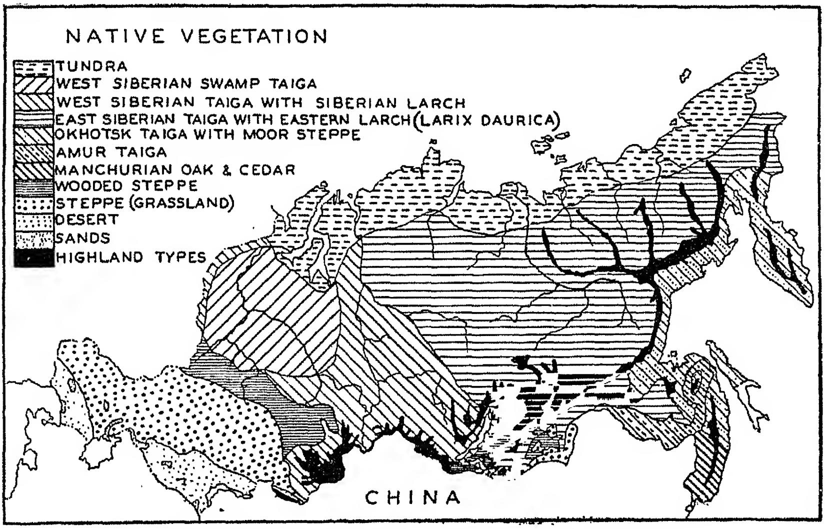

Fig. 186.—Native vegetation in Siberia. (After A. Schultz.)

that is, virgin forest. The areas of taiga are generally not continuous, except in the watershed areas; and even there they are intersected by streams, in the valleys of which marshes, swamps, and meadows predominate. Conifers constitute from two-thirds to three-fourths of all the trees of the northern coniferous forest, the remaining species being deciduous hardwoods. Pine, larch, Siberian fir (Abies), spruce, and cedar are characteristic Siberian conifers. Western Siberia contains a swamp taiga which gives way to a wooded-steppe zone in the southwest (Fig. 186). To the east and west of the swamp taiga, western Siberia contains forested areas in which the western larch is the predominant species. In eastern Siberia the so-called "eastern larch" or *Larix daurica,* pre-

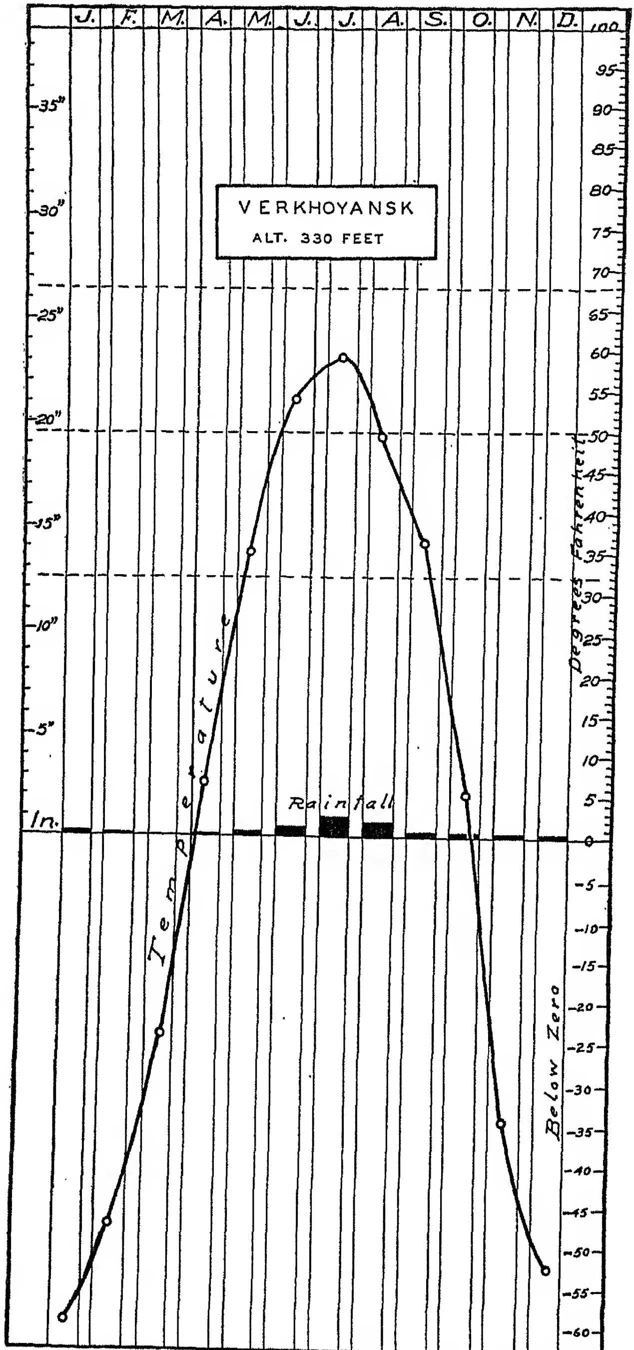

Fig. 187.—Note the tremendous range of the mean monthly temperatures from winter to summer at Verkhoyansk. Also note the small precipitation, less than four inches a year. Cold air has a low moisture-holding capacity.

dominates and, in the extreme eastern lands adjacent to the Sea of Okhotsk, gives way to the Okhotsk taiga, with its characteristic moor steppe. As one proceeds southeastward the deciduous species become more plentiful. Here the mixed forests (coniferous-deciduous) resemble those of Korea and Japan, with Manchurian cedar (Pinus manchurica), oak, and larch as the important species.

The climate of the northern coniferous forest affects not

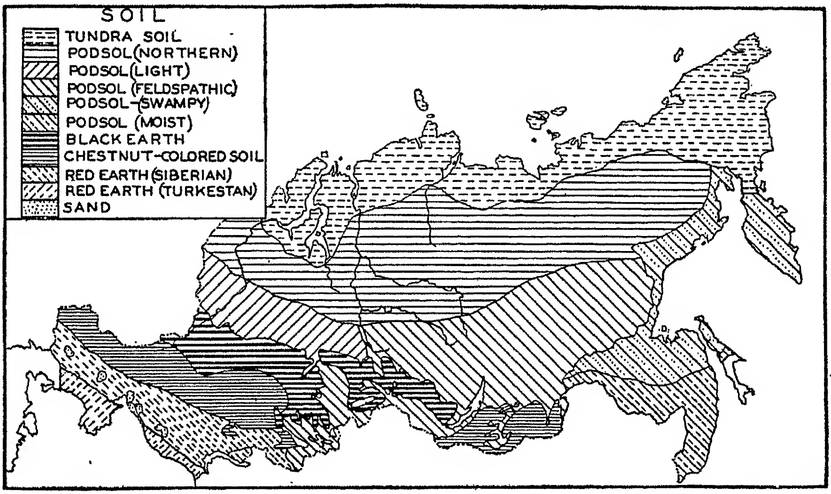

Fig. 188.—The soils of Siberia. (After A. Schultz.)

only the growth of the trees, but also the agricultural development. It is characterized by extremes. In the northeast, along the margins of the northern coniferous forest and tundra, the absolute range in temperature is the greatest on record. The lowest known temperatures of the world have been recorded at Verkhoyansk, northeastern Siberia. Here also the mean monthly range is considerable (Fig. 187). Seven months of winter and three months of summer further characterize the climate of this forest region, and the transition periods of spring and autumn are each but a month in length. Precipitation is 10 to 20 inches in the greater part of the area, and therefore is characteristic of semi-arid rather than humid lands. Yet the rate of evaporation is not great, because of the low tempera-

tures. Hence there is a plentiful supply of moisture. Trees rather than grasses constitute the chief type of native vegetation.

The wet surface is due not only to low rate of evaporation but also to the fact that the large Siberian rivers flow northward; and during the spring and early summer, when the ice melts in the southern middle and upper courses of these streams, their mouths long remain ice bound. Thus water is impounded in the river basins, and the soils of the lowest lands are therefore commonly waterlogged. For the region as a whole the distinctive soil is the podsol, a term derived from the Russian words "pod" and "sola," meaning soil the color of ashes (Fig. 188). Siberia contains the most extensive areas of ash-colored soil or podsol in the world. The podsol is not high in fertility and generally lacks a zone of lime-accumulation in the mature soil profile. Below its ash-colored top soil, the podsol contains a coffee-brown horizon, which in some places is indurated to a hardpan by materials obtained from the surface soil. Yet agriculture has been established in many districts of the northern coniferous forest, chiefly in the south.

As a human use region, the northern coniferous forest is a land of possibilities. At the present time the population is extremely sparse, and that in the northern part will so remain. But there are possibilities of further expansion of agriculture in the southern parts of the region, and some of the most extensive forests of the world await exploitation. In the drafting of the Five-Year Plan, the northern part of the region is recognized by the Russians as unfavorable for agriculture, and has, therefore, been designated as the Forest Belt. In the southern area the chief crops are flax, oats, rye, and barley, with wheat increasing in importance in the extreme southern part of the region. Dairying has been developed in some districts. This part of the northern coniferous forest is capable of sustaining a large agricultural population, although the density of population will be surpassed by that of the black earth belt to the south. The sparsely populated forest belt, as recognized by the Russian Planning Commission, contains

not only timber, but also valuable fur bearing animals. It constitutes a primary source of Russian furs.

The black earth belt.—The black earth belt is the chief agricultural region and the most densely populated part of

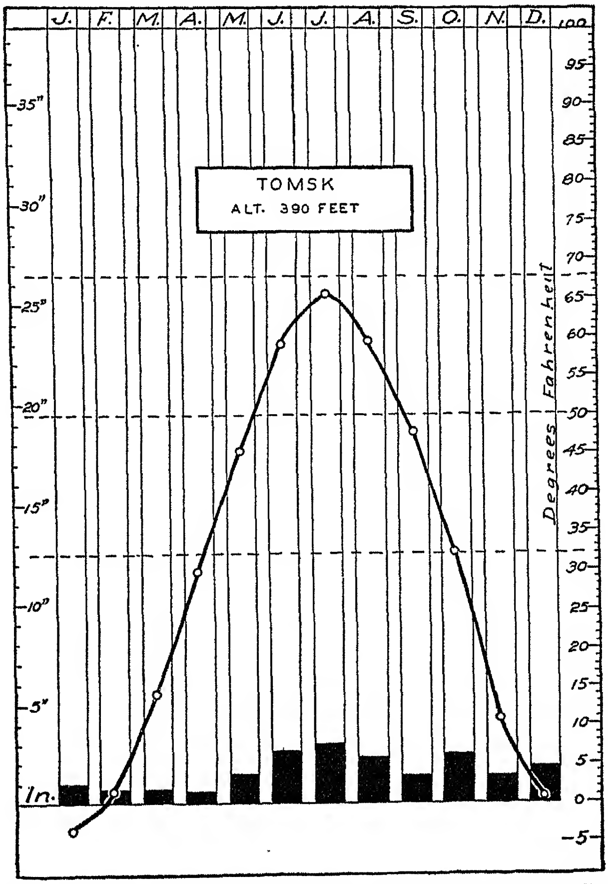

Fig. 189.—Mean monthly precipitation and temperatures at Tomsk.

the country (Fig. 185). Here the geographical base has favored agricultural development. The land is level to gently rolling, and the soil, known as "chernozem," is one of the finest in the world (Fig. 188). It has developed in a region of grassland, and is therefore well supplied with humus. It is

deep, friable, dark in color, well supplied with essential mineral plant foods, and has an excellent structure.[3]

The climate of this region is humid continental with short summers. The mean monthly temperature range from January, the coldest month, to July, the warmest, is noteworthy (Figs. 189 and 190). It reflects the interior position on the land mass, Eurasia, where there is great heating in summer and cooling in winter. Precipitation is not abundant, and decreases from north to south and from west to east within the region. It is erratic in occurrence, fluctuating to the greatest extent in the drier parts of the region.

Of all natural regions of Siberia, the black earth belt has witnessed the greatest agricultural development. It contains the largest proportion of cultivated land in all of Asiatic Russia. The most marked development of the region followed the completion of the Trans-Siberian railway in 1902. It has since become one of the major wheat producing units of the Soviet Union and will realize a further growth. In various ways this black earth belt of Russia is comparable to the black earth belt of the great plains of the United States. In the latter region, however, the precipitation decreases from east to west; whereas in the black earth belt of Russia it decreases from north to south and from west to east.

The steppe and desert.—Along its southern margins, the black earth belt gives way to semi-arid grasslands (Fig. 186). The region is characterized by chestnut colored soils, which compare favorable with the soils which lie to the west of the black earth belt in the great plains of the United States. The precipitation, of the region, however, is much too low for agriculture. Crops are cultivated only in a few oases where

[3] Soil structure refers to the arrangement of soil particles. A well-knit structure is due to the presence of various mineral substances, such as calcium, magnesium, and potassium. These cause the soil grains to cohere in the form of aggregates or small pea-sized lumps. But in areas of abundant rainfall these substances are readily washed away and the soil structure weakens. In the black earth belt, however, the low precipitation causes but little leaching, and the soil structure is one of the finest in the world. Even where the soil consists of very fine clay particles, the excellent structure of the chernozem prevents it from baking and cracking when wet.

irrigation can be practiced, and along the northern margins of the region. Scattered tribes of pastoral nomads constitute the major part of the population. The Kirghiz tribes and Tartars, the chief inhabitants of the steppe, keep horses, cattle, sheep, and camels. They continue the practices and nomadic fashions

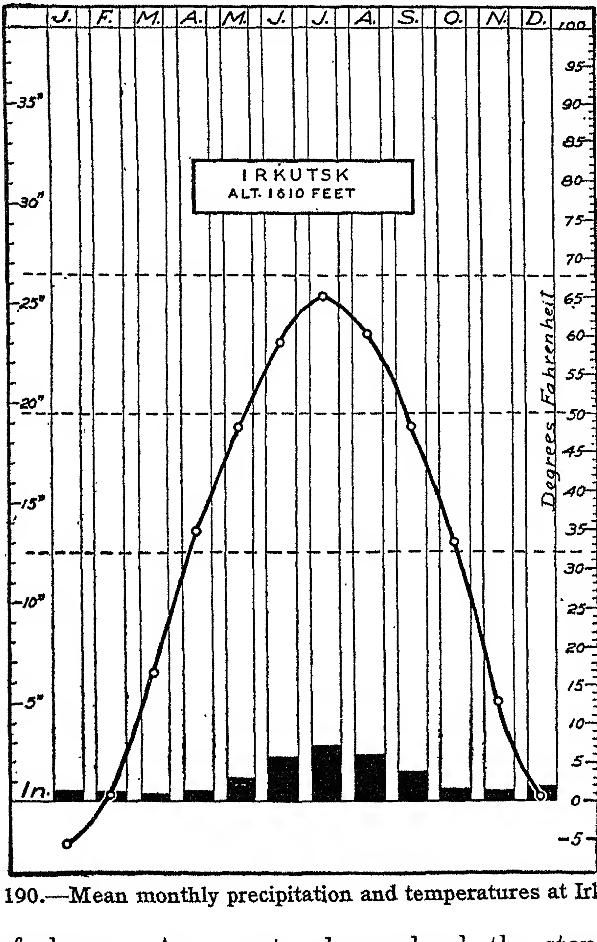

Fig. 190.—Mean monthly precipitation and temperatures at Irkutsk.

of their forbears. As a pastoral grassland, the steppe of Siberia will remain sparsely populated, although attempts are being made to extend dry farming into the more humid parts of the region. In addition, the economic development of the future will depend also upon the more complete utilization

of the mineral wealth of the area, such as coal, gold, silver, and copper.

In the southwestern part of Siberia, the semi-arid steppe gives way to desert toward the south (Fig. 191). This desert constitutes a zone of transition between Siberia and the sand desert of Russian Turkestan. Population is extremely sparse,

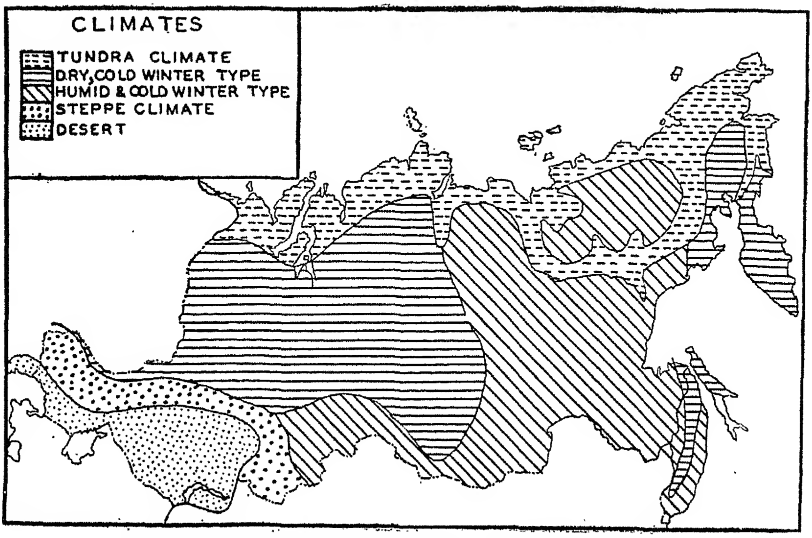

Fig. 191.—The climates of Siberia. (After A. Schultz.)

and there is no basis for population growth in this part of Siberia.

Highlands of Siberia.—The most extensive highlands of Siberia are located in the southern and eastern parts of the country. Here much of the land has an elevation of more than 3,000 feet above sea level (Fig. 192). In the extreme south the Altai-Sayan Ranges extend into Mongolia; whereas in the southeast the Yablonovoi and Stanovoi Mountains are the most conspicuous land forms.

The highlands of Siberia are noted for their mineral wealth, chiefly in the Altai-Sayan region. Here the valley of the Tom River, an upper tributary of the Ob, contains valuable deposits of coal, gold, and some iron ore. It contains the Kuznetzk coal fields, which are playing an increasingly important rôle

in the present-day economic system of Russia. Remarkable progress has been experienced in this Altai-Sayan region during the last decade (1923-1933), chiefly because of its mineral wealth. Yet the proportion of the population that may eventually be occupied in the exploitation of minerals as such will remain small. The processing or refining of the raw materials, however, has given rise to densely populated industrial communities.

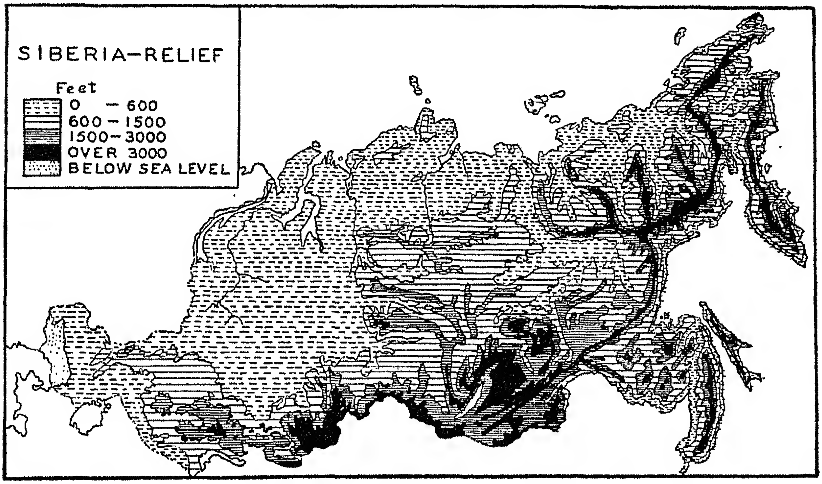

Fig. 192.—The relief of Siberia.

Major occupations: the agricultural industry.—Agriculture is the chief source of wealth and the major occupation of the masses of Siberian workers, and most of the people live in rural districts. At the present time agriculture in Siberia is confined very largely to the black earth belt and the southern part of the northern coniferous forest, as reflected in the dot distribution map of crop land (Fig. 193). The cultivated land is devoted mainly to grains. Of these, spring wheat occupies approximately one-half of the cropped area and is most widely distributed in the black earth belt. Oats and rye rank next to wheat in point of acreage. These crops—wheat, oats, and rye—together occupy more than four-fifths of all the cultivated land of Siberia. Other crops include barley, potatoes,

and flax; they are grown mainly in the southern part of the northern coniferous forest. On the chestnut-colored soils of the steppe of southwestern Siberia, dry farming is being stimulated by the authorities of the Soviet Union.[4]

Although Siberia contains more land than is found in all of Europe, the area suitable for cultivation is narrowly limited. In the north the Tundra is a non-agricultural land. In the

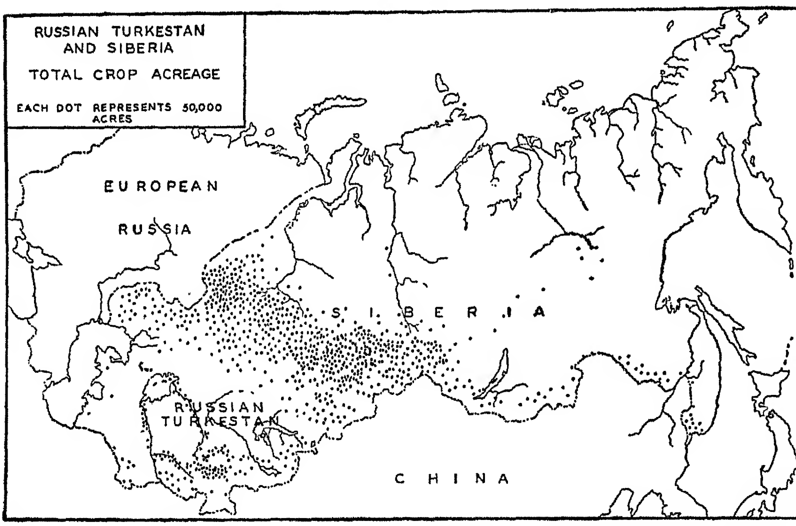

Fig. 193.—The total area sown in 1930-31. Compare this with the population map of Asiatic Russia.

western and extreme eastern parts of the northern coniferous forest, Siberia contains lands that are too wet, whereas the southwest is too dry for any considerable expansion of cultivated land. In the south, southeast, and east large highlands set definite limits to the expansion of the crop area.

Although there are broad limits beyond which Siberian agriculture will not expand, there is nevertheless room for further development in the agricultural zones of the country. Such development is being stimulated at the present time. With the growth of the mineral and forest industries and the

[4] Tulaikov, N. M.: "Agriculture in the Dry Region of the U.S.S.R." *Economic Geography,* Vol. VI (1930), pp. 54-80.

development of better means of transportation, the crop land of Siberia is being increased and utilized more intensively.

Utilization of forests.—As a major resource, the forests of Siberia are surpassed only by the soil and minerals. Extensive forests, some of the largest known to mankind, await further exploitation. Here the vast stretches of taiga contain many valuable species of trees, such as the pine, larch, fir, spruce, and cedar. The exact extent of these Siberian forests is not known. Estimates place the total timber-covered area anywhere from 800,000,000 to 2,700,000,000 acres. It is safe to say, however, that the Siberian forests are much more extensive than the original forests of the United States, although the stand as measured in board feet is, in all probability, less.

Although the forests of Siberia are extensive, they have been but slightly exploited. The lack of timber exploitation is accounted for by several reasons, among which are: (1) poor transportation facilities; (2) unstable political conditions; (3) lack of necessary capital; and (4) the poverty of the great masses of the people.

Any considerable utilization of Siberian forest resources in the future will take place chiefly in the extreme eastern and western parts of the northern forest zone. Some use is being made of the intervening forests for mine prop materials and other local necessities in the interior districts of the country. But these interior forests are inaccessible and remote from world markets. On the other hand, the eastern Siberian timber products might be exported to the countries bordering the Pacific Ocean, whereas the western Siberian taiga is being utilized to an ever-increasing extent by the inhabitants of the black earth belt and adjacent regions.

Exploitation of fur-bearing animals.—Extensive forests, almost inaccessible highlands, and sparse population favor the propagation of fur-bearing animals in Siberia. The necessary protection as well as food for the animals is provided in the northern coniferous forest. In some localities, hunting is the chief means of livelihood, whereas in other districts it supplements agriculture. Where hunting and trapping are well de-

veloped, a number of men, sometimes as many as 40 to 50, operate in a certain area until a sufficiently large store of pelts has been accumulated. In their exploitation of fur-bearing animals, the hunters and trappers obtain chiefly squirrel, sable, hare, ermine, bear, marten, and fox. At present the sable is found only in the relatively inaccessible regions, squirrels abound wherever spruce and cedar trees grow, the fox is at home in the wooded districts as well as in the steppe, and the best bearskins are obtained in Yakutsk Province. The finest pelts of arctic foxes come from the lower Lena River Basin.

Siberian furs are sent in large quantities to European Russia. Before the World War, major outlets or channels of Russian furs were by way of the Baltic states and Germany. At the present time, Moskva (Moscow) absorbs a large proportion of the Siberian furs.

Mineral resources.—Siberia's mineral wealth is surpassed only by that of her agriculture, and in recent years her mineral industries have witnessed the most phenomenal development. Before the World War the mineral industry suffered seriously from lack of capital, lack of favorable means of transportation, lack of sufficient labor, and the generally poor economic conditions that prevailed throughout the country. Even today these factors constitute impediments to progress, especially the fact that many areas lack suitable transportation facilities. Moreover, the mineral wealth of Siberia cannot be stated with scientific accuracy, since many areas have not been surveyed geologically.

Basic minerals, such as iron ore and coal, have been found in various places. Siberia is much better supplied with coal than with iron ore. Iron ore suitable for smelting occurs in the extreme western or Ural Mountain region, at Magnitogorsk. In addition, iron ore of good quality has been located at Telbes, which is approximately 40 miles south of the city of Kuznetzk. The largest and best coal fields are located in: (1) the Kuznetzk Basin; (2) the Irkutsk Basin; (3) the Kirghiz Steppe; and (4) Northern Karafuto (Sakhalin). Located between the towns of Tomsk and Kuznetzk, the Kuznetzk

Basin covers a rectangular area of approximately 9,000 square miles. Here high grade coking coals constitute a basic factor for a rapidly growing iron and steel industry. Among other Siberian minerals are gold, zinc, lead, silver, and petroleum. The Siberian gold fields are very extensive, and here the largest known areas of gold-bearing ore still await development. Zinc, lead, and silver occur in the Altai region and in the Transbaikal territory. Deposits of lead and silver are also found in the Kirghiz Steppes. Petroleum occurs in Northern Karafuto, where the oil reserve is estimated at 1,300,000,000 to 3,300,000,000 barrels.

Transportation.—One of the greatest handicaps to economic development in Siberia is the lack of suitable means of transportation in many parts of the country. Roads are poor and the waterways present limitations as means of transportation. The latter are generally unimproved and suffer from the short open period of navigation. In addition, the large rivers flow northward into the Arctic Ocean, whereas the movement of goods is mainly in an east-west direction and from north to south. Yet the rivers have been a primary factor in the opening up of new territories. As a means of communication, rivers are especially important in the dense taiga and swampy regions, areas that would otherwise be impassable.

Trans-Siberian railway.—The most marked economic development of Siberia followed the completion of the Trans-Siberian railway, which very effectively made possible the economic utilization of large stretches of Asiatic Russia to the east of the Urals. Colonists poured into the black soil belt, which is traversed by the railway. Here a nomadic mode of life quickly gave way to the production of crops. The completion of the railway also made possible the utilization of the great mineral wealth of the Altai-Sayan region. A number of feeder lines, some short and some long, greatly increase the area served by the railway. In addition, a very important branch line has been extended from Novo-Sibirsk and Semipalatinsk into Russian Turkestan, thus making available a large market for Siberian goods. The freight traffic on the

Trans-Siberian railway consists chiefly of grain (mostly wheat), and animal products, including meat, butter, hides, wool, and tallow. There is also a through traffic in merchandise from the Orient.

Industrial development.—Modern industry has made but small beginnings in Siberia, the most marked development being that of the last few years. Yet industry of some kind has been necessary in the economic system of the country, since many areas are remote from commercial centers and in many cases are even quite inaccessible. Thus home industries have developed, and the population in many parts of the country has been obliged to be self-sustaining. Although the craftmanship of Siberian home industries, or the so-called "kustari" has been very primitive, the consumers of the finished goods have not been discriminating buyers.[5]

Modern industry in Siberia is engaged chiefly in the manufacture of mineral products and foodstuff. Next in value of production are the distilleries, breweries, and tanneries. One of the most concentrated industrial units is in the Kuznetzk Basin, where the iron and steel industry has experienced a phenomenal development during recent years. The plants of the region obtain coal from the Kuznetzk coal fields and some iron ore locally, although the major source of supply of ore is the Magnitogorsk iron ore field, located in the Ural Mountain region. On the other hand, since the Magnitogorsk district lacks coking coal, this commodity constitutes an important item on the return trip from the Kuznetzk Basin. The growth of these so-called heavy industries has been much more marked than that of the industries which produce goods for everyday consumption.

Efforts are being made to further develop Siberia's industrial structure. Equipment and tools of various kinds are in constant demand by the agricultural population. Large forest resources await utilization and call for logging machinery, paper mills, and sawmills. Fish resources suggest the develop-

[5] Baievsky, Boris: "Siberia—Its Resources and Possibilities," *Trade Promotion Series*, No. 36, Department of Commerce, Washington, D. C., 1926, p. 63.

ment of canning plants, whereas mineral deposits call for mining machinery of various kinds. In most parts of the country further industrial growth will depend in large measure upon the development of transportation facilities.

Trade and industrial centers.—Most of Siberia's cities are small trade centers, serving their respective tributary areas. The larger cities have generally developed in localities highly favorable for trade, for manufacture, or for both. Thus, the city of Omsk has become the most noteworthy commercial city of Siberia. Situated at a point where the Trans-Siberian railway crosses the Irtush, an upper tributary of the Ob River, Omsk occupies a favorable location with respect to river and rail transportation, and functions as a major commercial center for a large and fertile agricultural area in the black earth belt.

Other Siberian cities with populations of approximately 100,000 or more are Novo-Sibirsk, Irkutsk, Vladivostock, Sverdlovsk, and Magnitogorsk. The two latter cities are located in the Ural Mountain region near the border of European and Asiatic Russia, and owe their development in large part to mineral industries. The rapidly growing industrial city of Novo-Sibirsk is located at the foot of the Altai-Sayan Mountains, and functions as a point of contact for the Turkestan and Trans-Siberian railways. Moreover, it is favorably located with respect to the mineral deposits of the Altai-Sayan Mountains. Irkutsk is the largest city in the Lake Baikal region. Vladivostok, the eastern terminus of the Trans-Siberian railway, functions as the chief commercial center in the southeastern part of Siberia, chiefly the large valley of the Amur River. The port has a well organized ice-breaking service, which makes possible year-round ocean trade at this point.

A planned economic life.—As part of the Soviet Union, Siberia is subject to a planned economy. This is true of the agriculture as well as the industry of the country. At the present time the Soviet Union has entered its Second Five-Year Plan. The First Five-Year Plan began in 1928, the second will end in 1937. What a Five-Year Plan does, as its

advocates contend, is to set certain goals of achievement at which to aim, and to mark out a general line of development. Thus the members of the All-Russian Conference of the Communist Party formulated the aims and objections of the Second Five-Year Plan, which will end in 1937. For example, among the objectives or goals of attainment are the following: (1) to produce 22,000,000 tons of pig iron annually by the year 1937, as compared with 8,800,000 tons in 1932; (2) to increase the average annual output of oil nearly three times; (3) to mine more than 250,000,000 tons of coal, as compared with 85,000,000 in 1932; (4) to generate by 1937 approximately 100,000,000,000 kilowatts of electricity, as compared with 17,000,000,000 in 1932; and (5) to increase the production of machines approximately three and a half times. Many other objectives or "directives," as they are sometimes called, are established for various economic activities, such as crop production, timber production, etc. It is also planned to have these develop in harmony with the increasing needs of the people. But there are some factors that the most critical and well-exercised planning can not anticipate, among which may be mentioned: erratic climatic conditions, especially periods of drought; new inventions; discovery of new sources of mineral wealth; and the movement of world prices, affecting the sums received for payment for exports.

One of the major projects of the Russian Government is the so-called "procuring" or "collection" of surplus agricultural commodities. Such crops are used for feeding the city populations and the army, and for the accumulation of reserves. Moreover, any surplus in excess of the above mentioned needs may be exported. During the last few years the Soviet Government has essentially had a monopoly on the trade of agricultural products, and all producers have been expected to deliver a certain part of their crop (one-fourth to one-third) to the Government.[6]

[6] Bureau of Agricultural Economics: "The Russian Procuring Plan and Methods," *Foreign Crops and Markets,* Vol. XXIV (1932), Washington, D. C., p. 955.

RUSSIAN TURKESTAN

Physical setting.—Located southwest of Siberia and set off from Afghanistan, Persia, and China by mountains and deserts, Russian Turkestan embraces a vast area of land that lies to the east of the Caspian Sea. It includes the Socialist Soviet Republics of Uzbekistan, Turkmenistan, and Tajikistan, as well as the Kirghiz Autonomous Socialist Soviet Republic and various autonomous areas. Together the various parts of Russian Turkestan cover an area of approximately one and a half million square miles of land and contain a total population of about 10,000,000.

The greater part of Russian Turkestan is a desert region with an interior system of drainage. The large rivers of the region rise in the well-watered peripheral highlands and lose themselves in the desert sands or in interior bodies of salt water, such as the Aral Sea, which covers approximately 2,500 square miles. The two master streams of the region are the Syr Darya, or Yaxartes, and the Amu Darya, or Oxus. The Syr Darya empties into the northeastern part of the Aral Sea, the Amu Darya into the southern part. The size of these rivers is better understood when one considers the fact that the Syr Darya is about as large as the Colorado River of the United States, and the Amu Darya is much larger. The extent to which these rivers function in the economic life of Russian Turkestan will be considered in another part of this chapter.

Physically, Russian Turkestan is made up of sand deserts, plains, mountains, mountain valleys, and plateaus. The deserts of Kizil Kum and Kara Kum occupy the vast interior and southern parts of the country, extending roughly from the Syr Darya southward to the highland borders of Persia and Afghanistan. The land which lies between the Caspian and Aral seas is occupied by the plateau of Ust Urt, whereas the southern borderlands are occupied by mountain slopes and valleys. The eastern part of the country is chiefly mountainous. One of the distinctive lowlands, the Fergana Valley, is one of the chief cotton-producing districts of Russian Tur-

kestan. It is located in the upper part of the drainage basin of the Syr Darya.

The climate of Russian Turkestan should be classified as semi-tropical desert and steppe. Merv, located in the southern part of the country, has an average annual precipitation of only 7.5 inches, whereas the rainfall at Tashkent is 14.6 inches a year (Figs. 194 and 195). The one station would therefore be considered desert, the other steppe. But even 14.6 inches

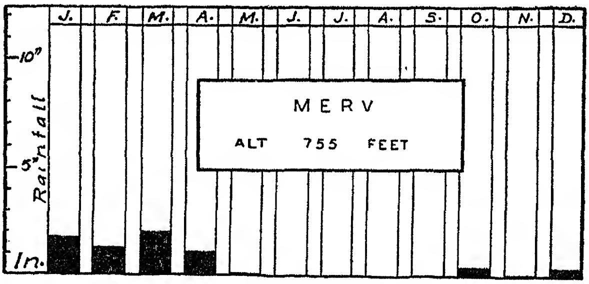

Fig. 194.—There is a desert precipitation of only 7.5 inches a year at this station in Russian Turkestan.

in this semi-tropical region of cloudless sky and rapid evaporation is insufficient for general crop production without the aid of irrigation. In fact, surface evaporation tests at Tashkent and Samarkand disclose the fact that evaporation at those centers is three times as great as precipitation; at Fergana it is approximately seven times as great. The frost-free period varies from 160 to 240 days.

Irrigation agriculture.—With a desert and steppe climate, Russian Turkestan has long depended upon artificial irrigation of some kind. Yet dry-farming is also practiced, chiefly in the semi-arid parts of the country. The highest per-acre yields and the best crop returns are obtained from the irrigated districts. Here whole cultures were founded on irrigation, and the most impressive monuments left by various races that have dominated over Turkestan are the irrigation works. Some of the old irrigation ditches are still used, but the majority of the irrigation works of the country that are now in use have been built by the Turkomens, Uzbecks, Tajiks, and

other present-day elements of the population. These constitute the so-called "native works," which serve a much larger area of crop land than do the modern irrigation systems.

The chief sources of water for irrigation are the Syr Darya and Amu Darya with their tributaries (Fig. 196). The Syr

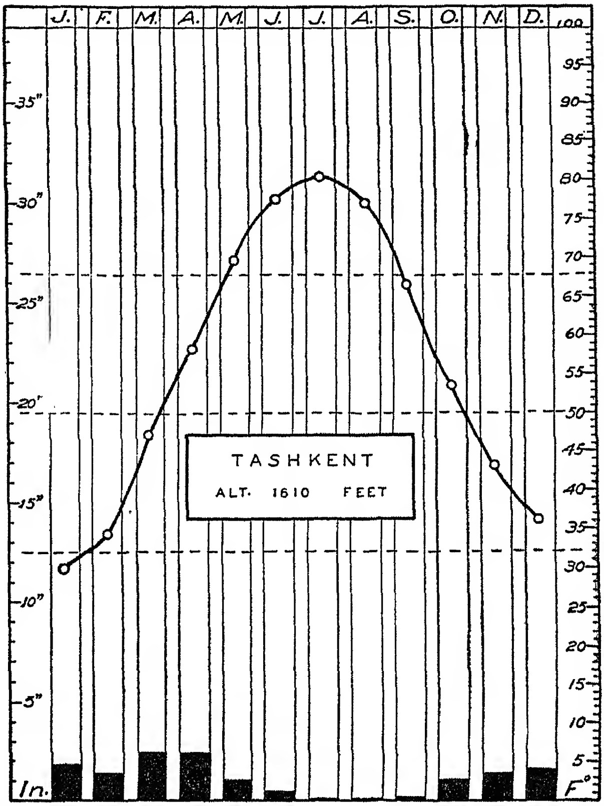

Fig. 195.—Although Tashkent receives an amount of precipitation which is characteristic of semi-arid lands, the greater part of it is experienced during the winter half-year. The summers are extremely dry, and evaporation is approximately three times as great as precipitation.

Darya, or the northern of these basins, contains the best cotton lands of Soviet Russia. The Amu Darya is formed in the mountains along the border of Afghanistan by the confluence of the Pianj and Voksh Rivers. It is much longer than the Syr Darya, and at one time had an even greater length,

when it emptied into the Caspian rather than the Aral Sea. The Kuni Darya is the old channel of this master stream. It has been suggested that the unused waters of the Amu Darya be diverted into its old channel and thereby make possible new lands for cultivation, but such a project is considered too expensive at the present time. The largest compact units of land irrigated by the Amu Darya are found in its lower part,

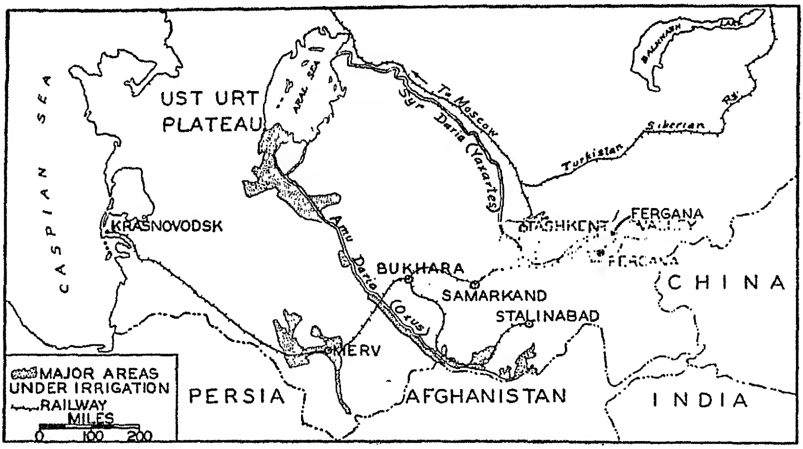

Fig. 196.—The major irrigated districts of Russian Turkestan. These districts account for the Soviet's position as one of the five leading cotton producers of the world.

or where it empties into the Aral Sea (Fig. 196). This lower region consists of an ancient and a modern delta, which have a combined area of several million available acres of level land. The upper part of the Amu Darya, near Afghanistan, contains several irrigation projects, and one is under construction at the present time in the Voksh River Valley. When completed, this project will add 250,000 acres of irrigated land to the cultivated area of Russian Turkestan. On the other hand, in its middle course the Amu Darya serves only a relatively narrow ribbon of land. Here the river passes through areas of shifting sands and meanders over a large flood plain, where deposits of silt and sand are carried into the irrigation ditches and canals.

One of the major cotton producing regions.—In 1933 Soviet Russia produced approximately 1,800,000 bales of cotton, which was more than the total cotton production of Egypt. It was surpassed only by the United States, India, and probably China.[7] By far the greater part of Russia's cotton crop is grown in Russian Turkestan. Here water for irrigation, long hot summers, and unleached soils favor production. Not all of the cotton, however, is grown with the aid of irrigation. Approximately 50,000 acres of land are devoted to the production of cotton under a system of dry farming. But the latter practice results in much lower yields, usually only one-third to one-half of those obtained per unit area in the irrigated districts. The latter districts have an average yield per acre of approximately 350 pounds of lint, which greatly surpasses the per-acre yields in India, the United States, and China. Of the major cotton producers, only Egypt exceeds the irrigated districts of Russian Turkestan in yields of cotton per acre.

The Russian cotton is grown chiefly for the domestic market, and efforts are being made to increase further the acreage of this crop. That frequently necessitates a decrease in other agricultural commodities, chiefly foodstuffs. But cheap Siberian grain is available and reaches the Turkestan market by way of the Turkestan-Siberian railway.

Other agricultural production.—The semi-tropical desert and steppe lands of Russian Turkestan are well adapted not only to cotton, but also to the production of rice, fruits, tobacco, and various other crops. Cotton, however, is the chief crop and occupies the greater part of the crop land in many districts, chiefly in the valley of the Syr Darya. In addition, vast stretches of steppe are devoted to pastoral activities, and support large numbers of livestock.

The most rapid agricultural development in recent years has been experienced on the agricultural holdings organized by the government, such as the collective and state farms. Col-

[7] Since China lacks an official census, the total production of cotton in that country has not been established with scientific accuracy.

lective farms are agricultural holdings on which there is joint cultivation of the land by the peasants. It is apparently more economical for a number of peasants to have modern equipment, fertilizers, and buildings in common than to operate as small individual farmers. Unlike the collective farms, which are based on the contributed resources of their peasant members, the state farms are financed by the government. These farms are the largest agricultural enterprises of the Soviet Union.

Mineral wealth.—Although the mineral output of Russian Turkestan is very small in value as compared with that of agriculture, the country has a reserve of various important minerals. Coal is found in the eastern and southeastern parts of the country, and petroleum in the west. In addition, there are valuable deposits of copper, zinc, lead, radium, and gold. These minerals occur mainly in the highland regions of the east and southeast.

Transportation.—The chief irrigated districts of Russian Turkestan are located approximately 2,000 miles away from Moskva (Moscow), the chief market for the raw cotton. Much of this intervening land consists of sparsely populated desert and steppe. Transportation has therefore long been a major factor. In the early days, caravans of camels carried the products of the region to distant markets and brought other commodities back in exchange. Since the development of cotton culture on a large scale, Turkestan has become increasingly dependent upon other areas for its foodstuffs, chiefly grains. These were brought into the region chiefly from Transcaucasia and the Ukraine of southern Russia until the completion of a railway which gave access to the great grain fields of the black earth belt of Siberia. This railway, generally called the "Turkestan-Siberian" or "Turk-Sib," is a thousand miles in length, cost approximately $100,000,000, and extends northward through Alma Ata, Semipalatinsk, to Novo-Sibirsk, where it connects with the Trans-Siberian trunk line (Fig. 197). Since its completion in 1930, the railway has

made possible an exchange of Turkestan cotton for Siberian grain and lumber.

Two other trunk lines serve Russian Turkestan; namely, the Trans-Caspian railway and the Orenburg-Tashkent railway. The Trans-Caspian is the oldest of the Turkestan railway lines. Completed in 1888, it follows the piedmont zone of the

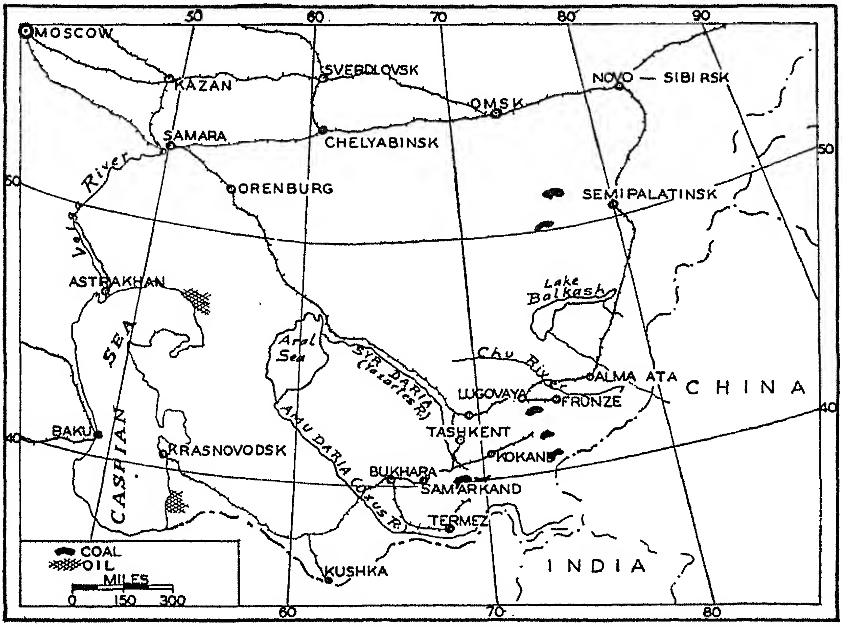

Fig. 197.—Sketch map showing railway contacts of Russian Turkestan with the Trans-Siberian railway system to the north and with Moscow to the northwest. Note the petroleum fields in the west and coal fields in the eastern part of the region.

highlands that lie along the Turkestan-Persian border. The western terminus is Krasnovodsk; the eastern terminii are Kushka and Ternez (Fig. 197). The Orenburg-Tashkent railway, completed in 1904, gives a more direct connection with European Russia. It extends northwestward from Tashkent, through Orenburg to Samara, following the Syr Darya and skirting the northern part of the Aral Sea.

Of all the trade and industrial centers served by rail transportation in Russian Turkestan, Tashkent is noteworthy. With a population of approximately one-third of a million, it is the largest city in all of central Asia.

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CHAPTER XXVIII

Asia's Trade and Future Possibilities

Basic factors affecting trade of Asiatic countries.—The degree of importance which world trade plays in the economic life of a nation is affected by a number of factors, of which the following are noteworthy: (1) size and population density; (2) geographic location; (3) amount and general character of resources; and (4) the degree of economic development.

As the largest of the continents, Asia contains a number of very large political units. But size alone does not make possible a large foreign trade. Thus, sparsely populated Asiatic Russia, with its vast continental sweep, has a foreign trade which is less than that of such small European countries as the Netherlands, Belgium, and Denmark. India, on the other hand, has not only a large size, but also a population of more than 350,000,000. Although the per capita productivity and standard of living in India are low, the teeming millions of the country make possible a relatively large total foreign trade. China is also vast in area and contains the largest population in Asia, but she has a low plane of economic life.

A favorable geographical location is fundamental with respect to the development of foreign trade. This is well illustrated in Japan, a country which is so situated and so poorly endowed with natural resources that international trade has become a necessary part of her economic life. In fact, since the opening of her doors to world-wide trade during the middle of last century, Japan's foreign trade has increased with remarkable rapidity, and at present accounts for more than 20 per cent of her total trade. In this respect Japan compares more nearly with the British Isles than she does with the United States. Located to the east of continental Asia, just

as the British Isles are located to the west of Europe, Japan has become an entrepot trader in Asia, just as Britain has become an outstanding entrepot trader in Europe.

Asia, as a whole, contains an abundance and a variety of natural resources. Of these the soil is most important, and this resource varies in character from place to place and therefore provides a diverse geographical base for a variety of agricultural commodities. No country of the Orient, however, contains a combination of mineral resources to provide for a family of metallurgical industries comparable to that of western Europe and eastern United States. Most of the mineral resources of the continent are but little exploited. Asiatic countries which are favored with an abundance and variety of natural resources are less dependent upon foreign trade than nations not so favored. China, India, and Asiatic Russia have a great variety of natural resources, but many of these are practically untouched as yet. The foreign trade of these countries will increase as the resources are more completely utilized and as the per capita productivity of the inhabitants of these lands increases. Southwestern Asia lacks abundant and varied resources, and the trade development there will always be narrowly limited by reason of unfavorable environmental conditions. Similarly, Japan is meagerly endowed with natural resources necessary to modern life. Thus she must import large quantities of raw materials; and in order to pay for these she must export almost as much in value as she imports, since Japan, unlike the British Isles, has but few invisible items in her balance of payments.

Asiatic countries in general are on a low plane of economic development. Ancient agricultural practices prevail, and the teeming millions have not harnessed the available power resources to aid them in their work. Modern implements and equipment are generally lacking. Economic productivity is therefore low, and foreign trade will increase as these teeming millions increase their power to produce more goods in exchange for a variety of commodities for the satisfaction of their wants and desires.

Per capita trade.—It is a generally recognized fact of commerce that a country's international trade will be relatively large if it has a comparative advantage over other nations in few lines of economic production. Thus, British Malaya has a high per capita trade ($56 imports and $52 exports per capita in 1931). The explanation lies in the fact that British Malaya finds its comparative advantage in but two products—tin and rubber. Specialization has resulted, a large part of the country's products are exported, and a variety of goods must be imported in order to satisfy the domestic needs.

Most Asiatic countries, however, have a low per capita trade. Their inhabitants suffer from a low per capita productivity and low standard of life. It is a well established fact that a varied demand is associated with a large foreign trade per capita. But a varied demand accompanies high living standards and high incomes, which are not generally found in Asia.

Agricultural interdependence.—The preceding chapters of this text have emphasized the distinctive geographical divisions of Asia and their chief lines of economic production. Striking contrasts in environment and economic activities are basic to the exchange of goods between various natural regions of the continent. Thus, India obtains large amounts of sugar from Java and sends jute and raw cotton to various parts of the continent, chiefly to Japan. Peninsular Indo-China sends its rice through the ports of Rangoon, Bangkok, and Saigon to the great rice-consuming lands of the Orient, chiefly the East Indies, China, and Japan. Soy beans from Manchukuo and raw cotton from China enter the markets of Japan in exchange for a variety of manufactured goods. In Soviet Russia raw cotton moves from western Turkestan to the more highly industrialized parts of the country. On the other hand, Turkestan obtains large quantities of cereals and foodstuffs from the black earth belt of Siberia and European Russia.

The agricultural interdependence should be considered also from a world-wide point of view. The various parts of the entire commercial world draw heavily upon the fruits of

southwestern Asia, the jute and raw cotton of India, the tea of India and Ceylon, the rubber of Malaya and the East Indies, and the rice of peninsular Indo-China. With the phenomenal development of plantation agriculture in India, the East Indies, Malaya, and the Philippines, Asia has become the chief source of supply of rubber, cinchona, tea, jute, and Manila hemp.

Industrial interdependence.—The industrial development in Asia varies strikingly from place to place. For the continent as a whole, agriculture is the dominant activity, the chief source of wealth, and engages approximately three-fourths of all the people. Modern industry is poorly developed. Thus, manufactured wares obtained from the two hubs of commerce —eastern United States and western Europe—are the leading items of import. One striking exception to this general rule is the Japanese import trade in raw cotton obtained from the United States.

Within the continent the varied industrial development has given rise to international trade. Japan is the most highly industrialized of the various Asiatic countries and sends large quantities of goods to different parts of the continent. Although she is meagerly endowed with natural resources, Japan is favored in the possession of abundant water power and labor, the latter being relatively highly skilled in the production of certain types of commodities. At present Japan is very successful with respect to her competition with other major cotton textile producing nations of the world in the markets of the Orient, and her raw silk export surpasses that of any other nation, with more than 90 per cent going to the United States.

The cotton textile and jute manufacturing industries of India have witnessed a remarkably rapid development since the World War. Thus India has become the chief source of gunny sacks, jute bags, and jute cloth in the commercial world. Yet there appears to be ample room for further development of India's textile industries. She still exports large amounts of raw cotton to Japan and the British Isles. Recog-

nizing the possibility of further developing the cotton textile industries of the country, nationalist leaders are urging the widespread establishment of domestic spinning and weaving.

Transportation as related to economic development.—Most parts of Asia are poorly equipped with transportation facilities. Large areas are served neither by railways nor good roads. Such conditions prevail in most districts of southwestern Asia, India, China, Asiatic Russia, and Manchukuo. Where communities are isolated and cut off from the outside world by reason of poor transportation, a self-supporting economy has resulted. Such communities at times may have a surplus of economic goods to offer in exchange for commodities that cannot be produced in their local areas, but poor transportation makes such trade impossible. With the establishment of cheap transportation, such communities would not only realize the possibility of marketing their surplus goods, but world-wide contacts would result in the development of new tastes and wants as well as the power to satisfy them.

A study of Japan's economic development reflects strikingly the importance of favorable transportation facilities as related to her industrial and commercial growth. On the other hand, China is very poorly equipped with modern means of transportation. Only one of her large rivers, the Yangtze, opens up the interior of the country to the outside world. More railways and modern roads are needed in order to weld together the diverse parts of the country. The East Indies and British Malaya have a favorable geographical location with respect to one of the major ocean routes of commerce. The most marked economic development in these southeastern countries of Asia has taken place in the peripheral or coastal regions, where commodities are easily available to tidewater and cheap ocean transportation to distant lands. India has 42,813 miles of railway line, but large areas of that country still lack modern means of transportation. Rail contact, for example, is entirely lacking between the province of Burma on the east and India proper. In most parts of interior penin-

sular India, dirt roads are almost impassable during summer. In southwestern Asia, caravan travel is still the most widely practiced, and modern rail transportation has made but small beginnings. In Soviet Russia the completion of the Turkestan Siberian or "Turk-Sib" railway in 1930 is noteworthy. Extending northward for a distance of a thousand miles to the Trans-Siberian trunk line, this railway has made possible the exchange of Turkestan cotton for Siberian grain and lumber.

Future utilization of natural resources.—Although Asiatic countries have developed their soil resource to the extent that the continent contains more cultivated land than any other major land mass, the minerals, forests, and water power resources are but little utilized. With 70,700,000 horsepower, Asia ranks second only to Africa in potential water power. Yet with respect to developed water power, the continent is surpassed by Europe and North America. In addition, the water power development in Asia has taken place mainly in Japan, which in 1930 accounted for 3,500,000 horsepower out of the total of 4,026,000 that had been developed in the whole continent. China and India have the greater share of the potential water power of Asia, but they are utilizing this power only to a very limited degree. Further industrial growth in these large countries will be associated with an increased development of their power resources.

In the utilization of basic mineral resources, such as coal and iron ore, Asiatic countries have made but small beginnings. The most noteworthy recent development has taken place in Japan and in Asiatic Russia, chiefly in the Kuznetzk Basin. Japan, the leading coal producer of the Orient, mined 29,374,000 tons of coal in 1930, which was equal to only 12 per cent of the coal production in the United Kingdom. The high cost of coking coal in Japan is one of the greatest obstacles to the economical production of iron and steel in that country. China contains large coal reserves, the largest of which remain practically untouched, in the loess highland region. The iron and steel industry of China, like that of Japan, suffers severely from the high cost of coking coal. Most of China's coal is

located in relatively inaccessible regions, which await better transportation facilities before this mineral will be widely used in satisfying the increasing requirements for fuel and power in the chief markets of the country. Moreover, the local shortage of timber for mine purposes constitutes a disadvantage with respect to the future exploitation of coal in China. In India the chief coal-producing districts are located to the west of Calcutta, within a radius of 200 miles. The development of the industry has been associated with the growth of the railway system of the country, and with the demands for coal by the modern textile as well as iron and steel plants. Yet India is only a minor producer of this mineral, with an output of 23,803,000 long tons of coal in 1930. Asia, as a whole, ranks third among the continents in the production of coal, but it is a poor third, being greatly surpassed by Europe and North America.[1]

The utilization of the continent's iron ore is at a very low level. The production of this metal shows little as to the actual amounts available for exploitation, since Asia has not developed her most extensive deposits. Of all Asiatic countries, Japan, Manchukuo, China, India, and Siberia are the leading producers of iron and steel, but the production in these countries is but a small per cent of the world's total (two to four per cent). Japan, the leading iron and steel producer in the Orient, lacks extensive deposits of iron ore. Within the Empire she has only about 80,000,000 tons of easily available ore, and domestic production takes place in a few areas, such as at Kamaishi, northeastern Hondo, and in Chosen. She therefore imports ore from China and Malaya, pig iron from Manchukuo, and iron and steel products as well as scrap iron from the two hubs of commerce—eastern United States and western Europe. The future development of the iron and steel industry of Japan will depend on assured access to pig iron and iron ore, lower costs of coke, and the further

[1] Asia accounts for only seven per cent of the total production of coal in the world.

development of hydro-electric power for the making of electric steel as well as machinery.

With a reserve that is established at approximately 738,000,000 metric tons, Manchukuo has the largest iron ore reserve in the Far East. Most of the easily available iron ores possess a low metallic content and a relatively high proportion of silica. Concentration, crushing, and roasting operations are therefore necessary. The silica is removed from the ore, and magnetic concentration follows. Such operations add to the costs of producing pig iron in Manchukuo and constitute a permanent disadvantage with respect to future operations of the iron and steel industry in that country. In China the iron and steel industry is seriously handicapped by the high price of coke. In India production is maintained chiefly by means of a high tariff, and the total output of iron ore is less than 2,000,000 tons a year (1,850,000 tons in 1930). The most spectacular iron and steel development has taken place in Asiatic Russia. Here two major areas are noteworthy: western Siberia, in the general region of Magnitogorsk and Sverdlovsk, which contain large deposits of iron ore; and the Kuznetzk Basin, one of the major coal-producing regions of the Soviet Union. The Soviet part of Asia will witness further expansion of metallurgical industries.

Asia functions as a relatively more significant producer of a few other minerals, such as petroleum, manganese, tin, tungsten, antimony, and emery. Petroleum is obtained chiefly from the southwestern and southeastern parts. In the southwest, Persia, Iraq, and Russian Turkestan are major contributors; in the southeast, the East Indies are most important. On the other hand, Japan and China are poorly equipped with this necessary fuel and power factor. The most important tin-producing zone of the world extends from the islands of Bangka and Belitong through British Malaya, southern Siam, southern Burma, into the province of Yunnan, southwest China. The small primitive tin workings of the Chinese and Malays are rapidly giving way as modern equipment is being

introduced and large mining companies are extending their holdings.

Large reserves of timber are found in the outer or peripheral parts of the continent, the vast interior stretches being too dry for tree growth. The forests of Asia are among the largest in the world, yet their timber is but little utilized. In the south the peninsula of Indo-China is an important source of teak. Thus, in Siam teak is normally one of the three leading items of export as well as an important source of revenue for the government. In the Philippines the exploitation of tropical timber shows a definite upward trend, and further development can be expected with the increasing utilization of hydro-electric power and the introduction of modern sawmills and modern methods for handling the timber. The most extensive of the Asiatic forests, however, are those of Siberia. These vast reserves of coniferous trees await exploitation. The most marked development may be expected in the regions accessible to fertile farm lands and to mining districts. The latter areas are utilizing the timber in a small way at present as mine prop materials, and a much larger development can be expected. The eastern part of this vast zone of conifers is favorably located with respect to the markets of China and Japan. Better transportation facilities and more stable political conditions are necessary before any appreciable commercial production can take place here.

In general, the continent of Asia as a whole ranks third in value among the major land masses in the utilization of its natural resources, being surpassed by North America and Europe. The utilization of resources has been greatly handicapped by a number of factors, among which are: (1) poor transportation; (2) lack of necessary capital; (3) unstable political conditions; and (4) the low productive power of the masses. Even in China, where cheap coolie labor is utilized in transporting commodities from place to place, the transport charges per ton are nevertheless very high. Such transportation is not cheap in spite of the low wages; it is often as high as 25 cents per ton mile, or about 10 times the rate on Amer-

ican railroads. Capital is definitely lacking in the exploitation of natural resources in most parts of the continent, and large foreign capital investments cannot be expected as long as political insecurity prevails. The low per capita productivity of Asiatic peoples means a low purchasing power and standard of life. Economic productivity will increase as better transportation facilities make possible the exchange of surplus products for those of distant lands, and as better tools and equipment are introduced.

Vast areas await future studies.—Asia is a rich field for further study. To the student of science, it offers a diverse setting, an ever-changing panorama of natural landscapes. To the student of social and political science, the continent offers diversity in language, in culture, in religion, and in political life. A multitude of problems is encountered, and their solution constitutes a challenge to students in diverse fields. The geographer finds here a great variety of cultural patterns. Detailed interpretation of the cultural landscapes as they have evolved in their natural setting has been extended only to a few limited areas in this largest of land masses. Industrial and commercial activities are in the process of change in some parts of the continent. These changes affect other members of the commercial world, and their interpretation constitutes a challenge to scholars of economic geography and economics. With the removal of the veil of political insecurity, even greater fields for detailed studies will be realized.

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